

RETHINKING DOWNTOWN HIGHWAYS

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RETHINKING DOWNTOWN HIGHWAYS

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Widening roads to ease congestion is like trying to cure obesity by loosening your belt.

Walter Kulash

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SUMMARY

Freeways have had a strong influence not only on the urban transportation but also on downtown areas both physically and socially. Certainly, they have extended the commuting limits of the city and made lower land costs more accessible. However, many of the mid-century freeways, once championed by planners as tools for urban renewal, have created swaths of blight through city neighborhoods. Their negative impacts on the larger urban framework requires new ideas for healthier alternatives to aid in preserving and building sustainable cities.

Removal of any downtown highway requires careful thought— even more consideration than when it was built. Quick solutions are what resulted in the problems that downtown highways of the Interstate-Era have today. If it is the simple interactions between people and place are that make up the positive aspects an urban environment, then what are the possibilities and strategies for removing urban highway, which are one of the primary impediments separating people in place in contemporary cities? This question is the focus of this thesis.

At its core, the removal of freeways represents a trade-off between mobility objectives and economic development objectives. Evidence from other cities' decisions to redesign or remove their downtown highways suggests multiple benefits. Making design changes, such as to replace a downtown highway with a well-designed surface boulevard, can stimulate economic activities without necessarily causing traffic chaos.

Solutions come in different shapes and sizes. The selected case studies in this thesis reflect a diversity of approaches – suggesting no single strategy exists for

addressing downtown highway issues. This reflects the fact that multiple alternatives must be considered in every situation because each approach varies in costs and opportunities. A typology of highway alternations derived from the case studies includes seven different techniques: burying, demolishing, taming, capping or bridging, elevating, retaining, and relocating. The final chapter applies the conclusions from the case studies to the Downtown Connector– Interstate 75/85– in Downtown Atlanta, Georgia.

Urban design and transportation planning has an emerging new set of values. Transportation planning is seeking to promote alternate modes of transportation to the private vehicle, like transit, by foot, or by bicycle. We now understand that connectivity is not served only by highways but also by urban street networks that invite modes other than just automobiles. An important role for urban design will be to shape the way these interactions are made to benefit the citizens, its urban spaces, and the economy.

CHAPTER 1

INTRODUCTION

1.1 Planning for the automobile

Between the years of 1918 and 1925, vehicle registration in the United States jumped from 6.2 million to 20.1 million [1]. The growth in the number of automobiles certainly had a power to shape the nation, and the nation was proud. Nevertheless, urban areas were experiencing such an increase in congestion. Road infrastructure was not equipped to handle the new demands. Thus, planners realized that, with current traffic data, new strategies must be set in place. Consultants prepared documents titled *major traffic street plans* for cities like Los Angeles, California and Portland, Oregon [2].

Leader of these cities' downtown businesses were major antagonists for these plans. They believed congestion was driving customers away from the central business district and to the suburbs [2]. A decline in customers meant a drop in these property values.

Because major traffic street plans were driven by the concerns of businesses, they focused on improving traffic patterns that would allow for easier, quicker access.

Proposed street systems began by highlighting which roads would have predicted high capacities of vehicles. Improving connectivity was the focus for these roads.

Enhancement of infrastructure meant widening lanes, straightening out their forms, installing signage or signals at major intersections, and removing dead ends [2].

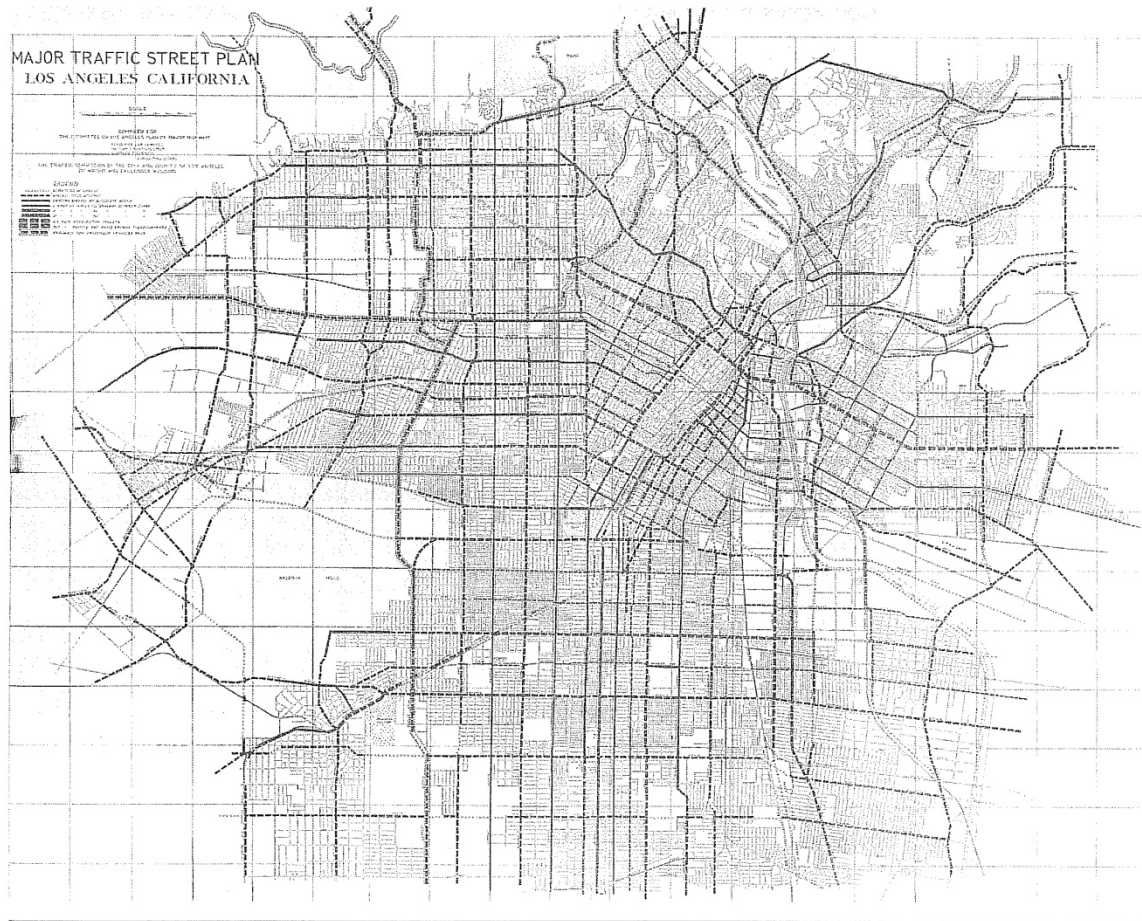


Figure 1.1: *Major Traffic Street Plan* for Los Angeles, 1924 [3]

The plans proposed a new classification system for downtown streets. Varying speed limits and road widths were to help guide traffic by use [2]. The different modes of transportation initially had separation. Authors of these plans began to lead toward a better coordination of transportation with land use [2]. Rights of way eventually became a priority over new developments [2]. Funding primarily came from property tax revenues. Citizens who understood these infrastructure changes were necessary for congestion relief financed further needs. Support was led by businesses in and around town, driving clubs, and real estate interests [3].

Grade separation proposed a design that echoed the future of high traffic. It was designed to allow for higher speeds, higher capacity, and direct links to certain parts of the city [3]. Just as the central business district became more readily accessed, these areas were just as easy to leave when the day was over. These changes were only furthered by the next major transportation system proposal.

1.2 The Lifespan of the Downtown Highway

From 1925-1929, again vehicle registration increased another thirty percent [1]. Major traffic street plans did not take into consideration a change so soon after. Surface streets and their rationalized geometry were no longer the solution. Planners like Harland Bartholomew designed what was thought to be final and permanent [2]. This new proposal pointed to a new classification for a roadway that allowed for seemingly unimaginable capacities, speeds, and convenience for private vehicle transportation in cities [2]. Named the freeway, speedway, expressway—the highway was in the works.

Highway design looked at rural and suburban parkways and characterized itself similarly by using two points [4]. First, grade separation brought with it safety [4]. It minimized disruption from crossing routes, effectively reducing collisions at intersections. Second, limited access helped prevent unpredictability from outside traffic [4]. Essentially both tools allowed for high capacity, high speeds, and fewer collisions.

Designs of the urban fabric took shape through their highways. Highway design initially considered how it would interact in its surroundings, flowing with the local and greater transportation networks [3]. The highway was just a part of the urban organism and not meant to be the controller. The idea of its footprint was kept subtle with two or

three lanes of traffic, and speeds of forty or fifty miles per hour [3]. Access points were to be created sparingly and shaped individually, to avoid disrupting the urban fabric [3].

The downtown highway was to be laid out in a dense network. The freeways would be smaller and more plentiful [3]. Traffic would be less concentrated in one area and vehicles could travel less distances in the downtown region to find access [3]. In contrast, many of today's downtown highways are sparse, in a ring/radial system.

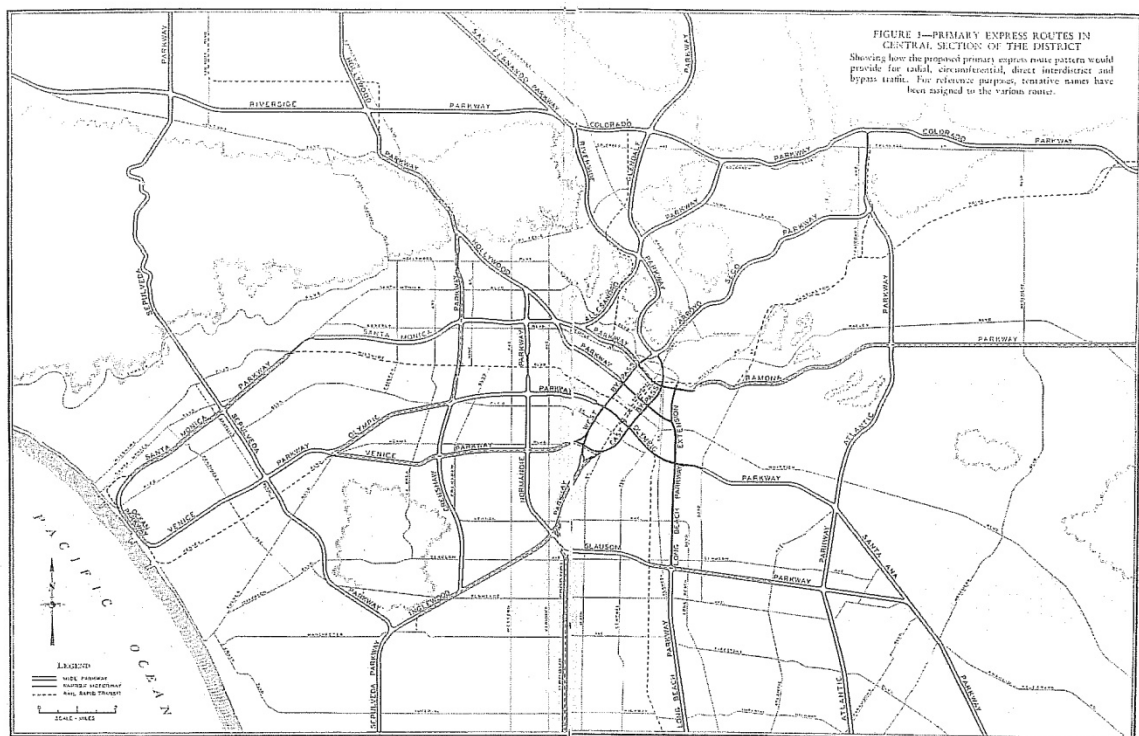


Figure 1.2: Freeways for the central part of Los Angeles, 1939 [3]

Transit had a place in many of these plans, sometimes along the median of these highways. Urban growth with these tools had planners believing in urban renewal and a slowing of suburban sprawl [2]. Looking back from the present, these leaders of planning just may have made a better outcome than the situation found today in so many cities

throughout the United States [4]. They had a strong belief that this system could bring great benefits, or great disruption if not followed properly [2].

Planners Facing Engineers

Early downtown highway design took into account factors that were short lived due to their soaring costs. As cities failed to come up with proper funding, they looked to other cities services, their state, and finally the federal government for help. Due to these ambitious proposals, urban planners lost the control to design this transportation network [5].

Due to the Great Depression and its issues with plummeting property values, cities lost funding, often revenue from property tax, and thus a change in funding was in order. Vehicle demand was still rising. The federal government issued a gasoline tax [5]. This shifted where the financing and the power of authority to design the highways would come from.

Depression-era highway building was initiated to help farmers, to increase efficiency in transporting their products, and to facilitate creating new jobs [2]. The engineers hired by the federal government were given a very different set of design ideas. From their perspective, form followed function [5]. The focus on traffic service disconnected the highway from its surrounds and its land-use [5]. The design also stemmed from safety, from fewer collisions. Efficiency took the reins of building highways. Vehicle speeds rose, the number of lanes rose, all while maintaining the same designs for each individual interchange, entrance, and exit to make the system safer for the driver [5]. Uniformity had power.

The engineers provided statistics and analytical techniques, eventually “winning the debate” over planners and their ideas that sacrificed vehicle throughput for the sake of the urban fabric [5]. The auto industry had a voice as well. Here again downtown business districts wanted to be more readily accessed by their customers. Congestion was the surface culprit.

The urban freeway eventually came to embody the engineering ideals [6]. The reason is simple: those who embraced the engineering vision had access to the money needed to translate their vision into reality, while those who embraced the planning vision generally did not [6]. Planners, tired of arguing unsuccessfully for a more comprehensive and balanced approach to freeway planning, finally gave in to the desire of most Americans to pour concrete as quickly as possible to *solve* the problem of urban traffic congestion [5].

With funding being secured at the federal level, urban, suburban, and rural regions wanted their fair share. A network of highways was proposed for the entire country [7]. After ten years of debate within the federal government, the federal interstate highway system was about to be set in place. However, this system seemed to benefit only rural areas [7]. To get urban legislators on board, urban segments of this plan had to be designed and proposed, no longer by the individual cities, but by the committee set up for this nationwide system, and in eight months [7]. The decades of planning before were useless. Once the legislation was passed in 1956, cities had a choice to accept the proposed downtown highway plans or opt out on federal funding for the transportation system [7].

Thus, these new downtown highway plans would quickly reshape urban form and travel patterns. The designs ripped the urban core apart, dividing neighborhoods, dividing races, and creating a sprawling periphery [2]. Interstate building peaked in 1966 and began a downfall due to new environmental laws and rapidly rising costs to build [4].

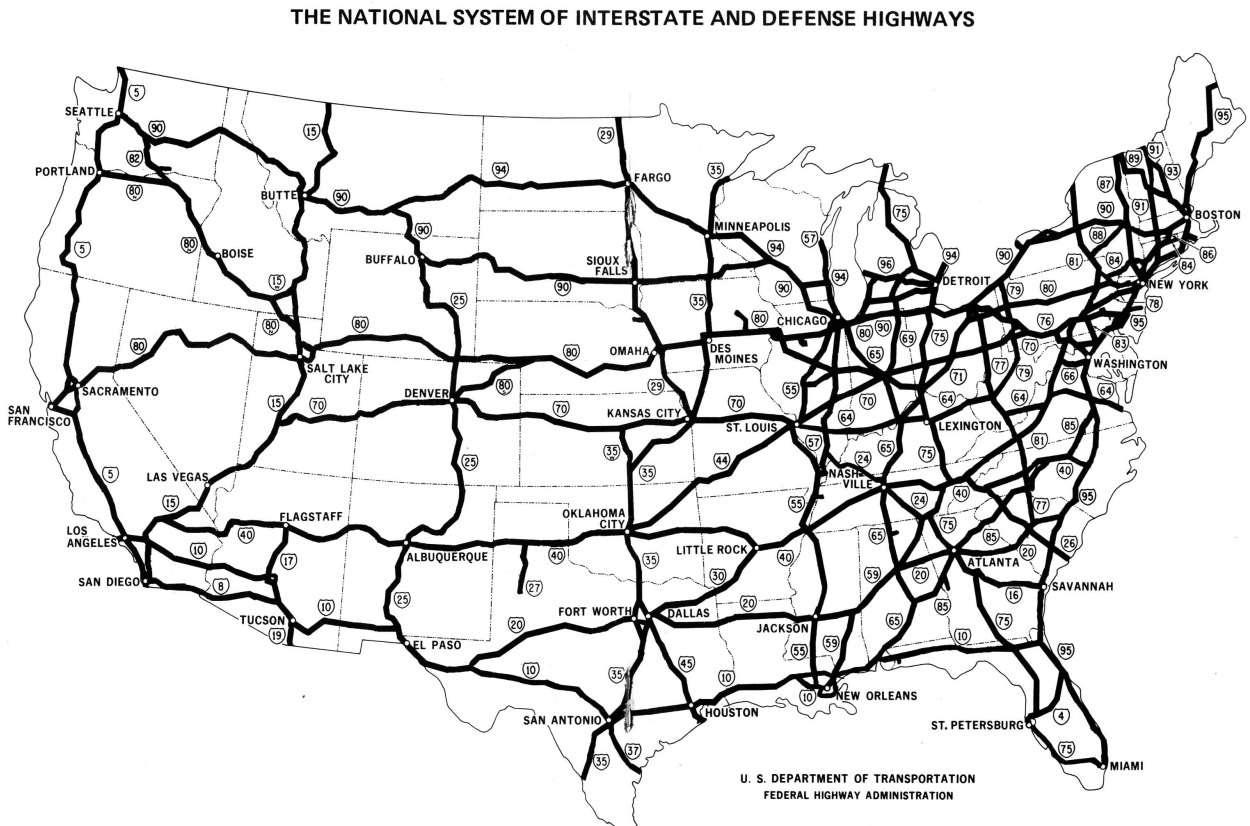


Figure 1.3: For the Federal Highway Administration, 1970 [8]

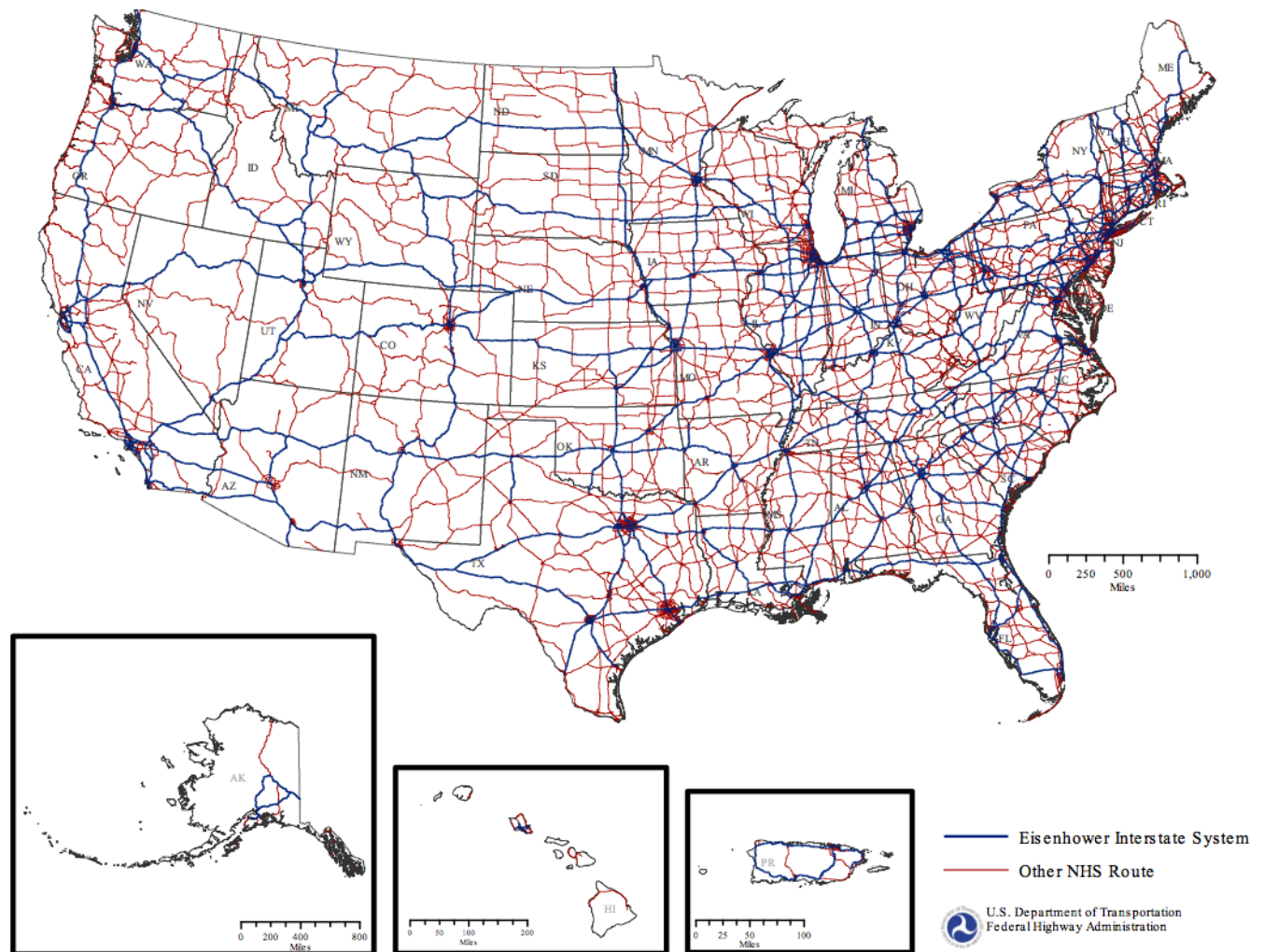


Figure 1.4: The National Highway System, 2009 [9]

Today and Tomorrow

The Dwight D. Eisenhower System of Interstate and Defense Highways has undoubtedly created prosperity through increased mobility and productivity [4]. Nonetheless, its hefty price tag was felt by the entire nation. In the long run, were freeways the most efficient way to managing the rise of private vehicle use? Or were there less-damaging ways? The consequences of transportation planning choices are not easy to overlook.

Such consequences of the National Highway System are seemingly endless. For one thing, downtown highways have caused a lack of connectivity between people and place. Place has become obsolete, except the inside of one's car. Accessibility only exists for the vehicle, so long as the roads are not congested and the distance to travel is optimum. This leads users away from seeking alternative modes of transportation or alternate routes. Neighborhoods suffer with downtown highways. Cities have lost their freedom by creating physical and social barriers, which often magnify racial boundaries [2].

The rapid decline of freeway-building by 1976, just twenty years after its commencement, was stopped in part due to citizens' revolts [10]. Additionally, building simply stopped due to the lack of funding. In some cases the anti-highway movement made history in a big way, using popular and political pressure to block highway projects [10].

Control is slowly shifting back to the local and city level, as they search for ways to pay for an infrastructural system that works for them [11]. Planners are now forced to comply with the 1970 National Environmental Policy Act, taking on the consequences of ignoring land use and the surrounding environment, both the social and physical parts in planning [11]. Transportation has a long way to go, for now its ad hoc planning is suggesting a positive change. Just as planners like Harland Bartholomew have suggested, transportation planning must take into account land use for smarter growth.

CHAPTER 2

ALTERNATIVES

2.1 Consequences and Benefits

Although this paper aims to explain ways in which building downtown highways decrease connectivity between people and place, a more notorious consequence of urban freeways is their ability to create congestion. Transportation planners believe highways result in increased mobility, high-speed travel, and reduced conflicts [12]. A city without a freeway system may introduce pedestrian-vehicular conflict at every intersection (nonetheless, good design may be able to overcome this) [12]. In addition, without a highway, through-traffic could be at slower speeds, resulting in higher pollution and greenhouse gases [12]. Is the best way to untangle traffic by building more roads? Traffic studies all over the world have concluded one thing: the complexity in travel behavior prevents any theory about the reasons for congestion becoming fact. In other words, the reason has to do with the complex effects of individual drivers all trying to optimize their routes [13].

Some planners believe traffic to be counter-intuitive. If the demand of drivers is maintained at a constant level, congestion reaches a point at which it constrains further growth in “peak-period” trips [13]. The phenomenon of induced demand— or the “if you build it, they will come” effect— suggests new roads encourage people to drive more miles, resulting in the production of suburban sprawl, that shifts new users onto these roads [13]. Research indicates that generated traffic often fills a significant portion of capacity added to congested urban roads, as seen below in figure 5. As supply (road

capacity) increases, cost (time) should decrease. But with the cost of a trip decreasing, demand (drivers) increases which lengthens the travel time. Induced demand is a vicious cycle with a simple solution— to not add road capacity.

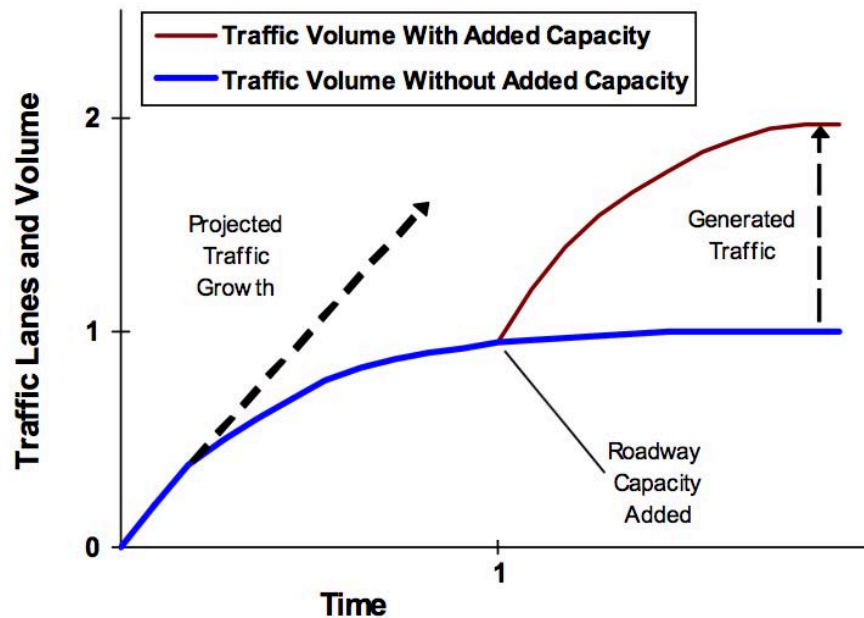


Figure 2.1: How Expansion of Roadway Capacity Can Generate Traffic [13]

An introduction of one famous example demonstrating this paradox was by mathematician Dietrich Braess in 1968, which shows that “one additional link to the network may cause longer travel times for every traveler if all travelers choose to minimize their own travel times” [13]. In this case, each traveler’s decision may achieve a user equilibrium that makes everyone worse off, and thus increases total travel time and cost [13]. Widening a highway could also encourage people to make more trips, longer trips, and more private-vehicle trips, increasing travel time by inducing new demand.

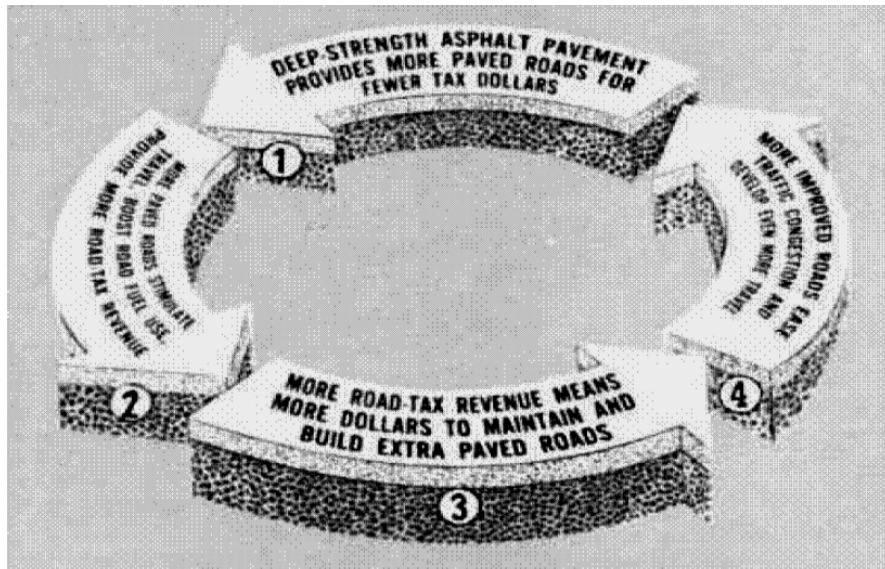


Figure 2.2: The vicious cycle from the cover of *Asphalt Bulletin*, 1966 [13]

This illustration of roadway expansion promoting more travel reveals the thought process induced demand explains. Written at the peak of highway building in the United States, induced demand is not a new proposition. It just has new meaning. Many cities affected by the interstate-era now realize stimulating the need for more roads is not an accepted goal. What if this diagram replaced all words of *pavement*, *asphalt*, and *roads* with *rails*, *tracks*, and *transit*?

Although improving congestion is not the main reason why a city would want to knock down a poorly planned highway, the counterpart of induced demand – reduced demand – can make a strong argument for doing so. Assuming population increases in an area, then demand to travel is following a congruent path. If this area chooses not to increase the supply of roadways, such as expanding a downtown highway, the cost of travel will reach a point in which users find alternatives. Likewise, if a downtown highway were reduced in size or removed all together, alternatives would be needed even faster. Such alternatives would ideally allow for what an urban freeway was designed for:

increased mobility, reduced conflicts, and optimal trip times and costs. What does this mean for the life of a city?

The many beneficial reasons for urban freeway deconstruction are not as easily demonstrated by scientific theories. Tearing down a downtown highway is thought to help enliven an urban area, improve citizen health, restore the local environment, and energize the regional economy. However, it requires much thought on policy and design. Looking at completed projects of highway deconstruction in other cities has the potential to reveal validity in these ideas for improving urban areas.

2.2 Comprehensive Project Listing

A common theme is that cities often consider highway removal when the highway becomes functionally obsolete. This occurs either at the end of the highway's useful life or after natural disaster. Another theme is that highway removal decisions are usually made in the context of a significant shift of priorities. City leaders and citizens alike begin to prioritize the goals of sustainable urban development over those of the private vehicle. This latter lesson may have particular resonance for cities like Atlanta, Georgia.

The selected case studies serve multiple purposes. The examples illustrate potential alternative design and development scenarios. Additionally, the cases offer urban design strategies to suggest what can work and what will struggle to work. What are the most innovative ideas for redeveloping land reclaimed by highway removal? How have cities improved conditions around the freed spaces? Are the highway changes an integrated planning and urban design strategy or just an attempt to solve a local problem? An integrated approach identifies the full range of issues and opportunities – from urban design to open space, economic development, and the environment. The least imaginative

projects are those that consider the problem only from the perspective of transportation.

Often these case studies share a common context brought on by a significant social or economic change. The industrial land and waterfronts of the mid-twentieth century created a need for easy traffic access. As technology changed, so too did industrial types and locations. Removing highways along former industrial territories and waterfronts are a major focus of highway redesign and removal. These are often related to cities' reclaiming waterfronts or brownfields for parks, new residential developments or civic institutions.

The shift to the suburbs to get access to more land at lower costs for the expanding post WWII urban population was a primary argument for urban highways. However, after securing a way for convenient access to central business districts, cities changed radically. Population growth— in quantity, coverage and density— increased demand for road capacity, along with the dependency on automobiles with the decline of transit. With costly travel time, bedroom communities became home to offices, retail space, and institutions. As a result, some cities have highways that no longer serve their original purpose. Instead of aiding access to the central business district, highways are parts of larger metropolitan networks and often have primary roles for local traffic, moving short distances. Or they are used for regional traffic passing through the center of cities. These highways are more difficult to remove, but can be redesigned.

The realization that cities have the power to change their downtown highways has created an unprecedented quantity of planning proposals from cities around the world. The following map and table is a selection of these cities and their projects, whether completed, in process, planned, or proposed with hopeful intent.

Table of the Comprehensive Project Listing

LOCATION	CORRIDOR	CLASSIFICATION	NAME	YEAR OF PROPOSAL ACCEPTED	YEAR OF COMPLETION	PROJECTED COST (Not Inflated)	ACTUAL COST (Not Inflated)
Seattle, Washington	I-5 at First Hill	Capping/Bridging	Freeway Park	1969	1976		\$24 million
Portland, Oregon	West bank of I-5	Demolish	RiverPlace	1974	1988 (1978)		\$150 million
Phoenix, Arizona	Papago Freeway	Capping/Bridging	Deck Park Tunnel	1975	1990		\$700 million
Duluth, Minnesota	I-35 at Lake Superior	Capping/Bridging	Lake Place	1977	1995	\$45 million	\$200 million
Boston, Massachusetts	Central Artery	Bury	The Big Dig and the Rose Kennedy Greenway	1982 (1970s)	1991 - 2004	\$2.9 billion	\$14.8 billion
Paris, France	Viaduc des Arts	Retain: Ameliorate	Promenade Plantée	1987	2000		\$25 million
San Francisco, California	Embarcadero Freeway	Demolish	The Embarcadero	1989	1991	\$171 million	\$210 million
Manhattan, New York	West Side Highway	Tame	West Street and the Hudson River Park	1993 (1973)	2001	\$380 million	\$811 million
San Francisco, California	Central Freeway	Tame	Octavia Boulevard	1995 (1989)	2005	\$20 million	\$50.3 million
Chicago, Illinois	decommissioned suppressed rail	Capping/Bridging	Millennium Park	1998	2004	\$150 million	\$490 million
Milwaukee, Wisconsin	Park East Freeway	Tame	McKinley Avenue	2000	2003	\$25 million	\$80 million
Chattanooga, Tennessee	Riverfront Parkway	Tame	21st Century Waterfront	2000	2005		\$140 million
Seoul, Korea	Cheonggyecheon Expressway	Demolish	Cheonggyecheon River	2002	2005		\$390 million
Oklahoma City, Oklahoma	Crosstown Expressway	Relocate	Crosstown Expressway	2002	N/A	\$360 million (now \$657 million)	N/A
Amsterdam, The Netherlands	A8ern8	Retain: Ameliorate	Zaanstaad	2003	2005		\$3 million
Manhattan, New York	decommissioned elevated rail	Retain: Ameliorate	The Highline	2004 (1999)	N/A	\$60+ million	N/A
Shanghai, China	various elevated highways	Retain: Ameliorate	Shanghai Street Greening	2004	N/A	\$120 million	N/A
Trenton, New Jersey	US - 29	Capping/Bridging	RiverWalk	2008	2010		\$150 million
Cincinnati, Ohio	The Washington Way	Capping/Bridging	Ohio River waterfront	2009 (1996)	N/A	\$1 billion	N/A

LOCATION	CORRIDOR	CLASSIFICATION	NAME	YEAR OF PROPOSAL ACCEPTED	YEAR OF COMPLETION	PROJECTED COST (Not Inflated)	ACTUAL COST (Not Inflated)
Manhattan, New York	F.D.R. Drive	Retain: Ameliorate	East River Esplanade	2010	N/A	\$150 million	N/A
New Haven, Connecticut	Route 34	Tame	Downtown Crossing	2010	N/A	\$31.7 million	N/A
Paris, France	Georges Pompidou Expressway	Retain: Ameliorate	"Paris Plages" and quai restoration	N/A (2002)	N/A	\$70 million	N/A
Tokyo, Japan	Metropolitan Expressway	Bury	Nihonbashi River	N/A	N/A	\$6 billion	N/A
Seattle, Washington	Alaskan Way Viaduct	Tame or Bury	Elliot Bay waterfront	N/A	N/A	\$2.81-\$4.24 billion	N/A
Toronto, Ontario	Gardiner Expressway East	Tame	Waterfront Toronto	N/A	N/A	\$758 million	N/A
Buffalo, New York	Skyway	Demolish or Tame	Outer Harbor waterfront	N/A	N/A	\$124 million	N/A
Montreal, Quebec	Bonaventure Expressway	Tame	Bonaventure Boulevard	N/A	N/A	\$90 million	N/A
Portland, Oregon	East bank of I-5	Demolish	East Bank Parkside	N/A	N/A	\$75 million	N/A
New Orleans, Louisiana	Claiborne Expressway	Tame	Claiborne Avenue	N/A	N/A	\$70 million	N/A
Bronx, New York	Sheridan Expressway	Demolish or Tame	Bronx riverfront	N/A	N/A		N/A
Philadelphia, Pennsylvania	I-95	Demolish or Tame	Delaware Riverfront	N/A	N/A		N/A
Washington, DC	Whitehurst Freeway	Tame	Georgetown Waterfront	N/A	N/A		N/A
Louisville, Kentucky	I-64	Demolish or Tame	Waterfront Parkway	N/A	N/A		N/A
Fourchon, Louisiana	LA-1	Elevate	prevent flooding issues	N/A	N/A		N/A
Honolulu, Hawaii	Pali Highway	Elevate	improve driving conditions	N/A	N/A		N/A
Providence, Rhode Island	I-195	Relocate	I-195	N/A	N/A		N/A
St. Louis, Missouri	I-70	Capping/Bridging		N/A	N/A		N/A
Dallas, Texas	Woodall Rogers Freeway	Capping/Bridging		N/A	N/A		N/A

LOCATION	CORRIDOR	CLASSIFICATION	NAME	YEAR OF PROPOSAL ACCEPTED	YEAR OF COMPLETION	PROJECTED COST Not Inflated)	ACTUAL COST (Not Inflated)
San Diego, California	I-5 at Bilbao Park	Capping/Bridging		N/A	N/A		N/A
Rochester, New York	Innerloop	Demolish		N/A	N/A		N/A
Akron, Ohio	Innerbelt	Demolish		N/A	N/A		N/A
Sidney, Australia	Cahill Expressway	Bury		N/A	N/A		N/A
Chicago, Illinois	Lakeshore Drive	Demolish		N/A	N/A		N/A
Nashville, Tennessee	Downtown Loop	Demolish or Tame		N/A	N/A		N/A
Hartford, Connecticut	Aetna Viaduct	Demolish or Tame		N/A	N/A		N/A
Syracuse, New York	I-81	Demolish or Tame		N/A	N/A		N/A
Cleveland, Ohio	West Shoreway	Tame		N/A	N/A		N/A
Baltimore, Maryland	Jones Falls Expressway	Tame		N/A	N/A		N/A



Figure 2.3: World Map of Project Sites
(See Appendix A for a scale comparison of each case study's project site)

2.3 Selected Case Studies

2.3.1 Boston, Massachusetts

Boston was an early participant in freeway planning. Boston's first regional freeway plan, the Report on a Thoroughfare Plan for Boston, proposed the construction of a radial combined parkway and freeway network whose primary purpose was to provide better access into and through severely congested downtown Boston [14]. The infamous Central Artery was among the facilities that were proposed by Robert H. Whitten in 1929 to provide better north-south access through downtown Boston [15].

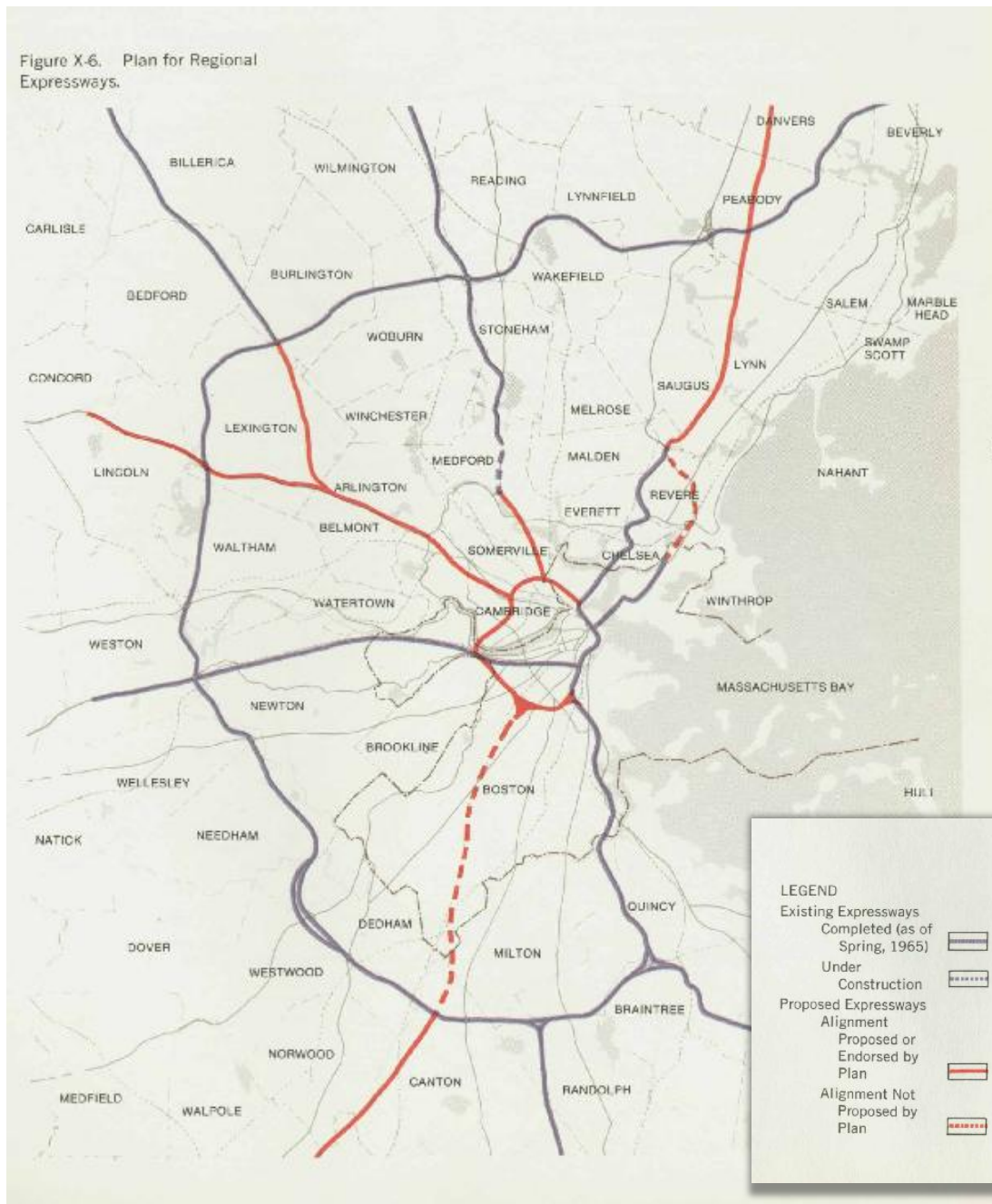


Figure 2.4: Freeway Plan for the City of Boston and the Regional Core, 1965 [14]

Yet it wasn't until post World War II that the Central Artery was initially constructed. It was built as a partly elevated and divided highway. Immediately, residents began to hate the new highway and the way it towered over and separated neighborhoods [15]. Due to this opposition, the southern end of the Central Artery through the South

Station area was built underground, through what became known as the Dewey Square Tunnel [15]. The idea of building the entire Artery underground was first expressed in the 1970s emanating from the central artery depression concept developed by the Boston Transportation Planning Review [15].

The East Boston Elevated Highway was designed to connect the Sumner Tunnel with the Logan International airport and to provide a high-speed expressway through East Boston to connect with the existing highway to the north [15]. The six-lane expressway rose above the streets of East Boston. In 1977, the state spent \$10 million and seven months to rebuild the elevated roadway sections, but the expressway remained flawed because of its designs, such as sharp curves, a lack of shoulders, and inadequate acceleration-deceleration lanes [15].



Figure 2.5: Boston, Massachusetts in 1981 [16]

Building the Artery along Boston's waterfront seemed most logical. Boston's business district, once centered on shipping, was located here [17]. But the Artery cut into the urban forms of Boston. It kept pedestrians from the water. The downtown highway's height overwhelmed low-rise streets and historic public spaces and places, leaving the area with traffic, noise, and shadow [17]. The Italian North End was simply erased, displacing its small businesses and hundreds of families [17]. Owners of some buildings that escaped the bulldozers bricked over windows that faced the Artery [17].

Though it did enable suburban workers to get to new office jobs, the Artery quickly became obsolete. The expressway was increasingly choked with bumper-to-bumper traffic. Business leaders were more concerned about access to Logan Airport, and pushed instead for a third harbor tunnel [15]. Poorly designed and constructed, it had structural problems and an accident rate four times the national average, because drivers veering toward the highway's downtown exits collided with drivers continuing to the airport [17]. With limited access that urban highways often provide, the traffic had nowhere else to go.

Eventually, the entire highway would be moved underground as part of the Big Dig Project. (The Dewey Square Tunnel was the one part of the original Artery not torn down; it now serves southbound traffic [17].) Planning for the Big Dig as a project officially began in 1982. After years of extensive lobbying for federal funding, the project had its green light and ground was first broken in 1991 [15].

The Massachusetts Turnpike Authority (MTA), which did not have the experience to manage a project this size, hired the firm of Bechtel/Parsons Brinckerhoff to provide preliminary designs, manage consultants and contractors, track the project's cost and

schedule, advise MTA on project decisions, and help represent them [17]. Parsons was an expert in innovative urban tunneling dating to the early twentieth century, when it built New York City's subways [17]. Bechtel had constructed the Hoover Dam [17]. However, a task this complex surely could have benefitted from the oversight of a federal administering group, rather than seeking private help.

The "Big Dig" was expected to cost \$5.6 billion and totaled \$14.8 billion at completion [18]. In short, the sticker shock for the public has created lawsuits against certain entities that did know estimates were far lower than they should have been [17]. In addition to political and financial difficulties, the project faced several environmental and engineering obstacles. The downtown area through which the tunnels were to be dug was largely landfill, and included existing subway lines as well as innumerable pipes and utility lines that would have to be replaced or moved [18].

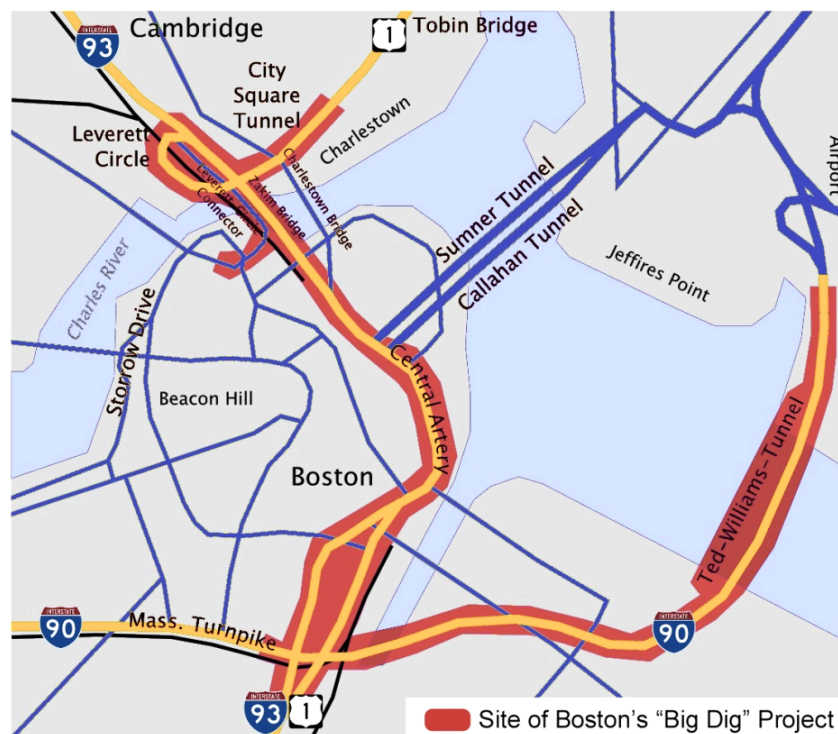


Figure 2.6: Map of the "Big Dig's" Project Borders [19]

Tunnel workers encountered many unexpected geological and archaeological barriers, ranging from remnants of glaciers to foundations of buried houses and a number of sunken ships lying within the reclaimed landfill [18].



Figure 2.7: Boston's downtown highway edging the harbor, 1990 [20]

Travel time through downtown at afternoon rush hour has decreased from nearly twenty minutes to less than three, consistent with pre-construction estimates [17]. However, speed is becoming a problem within the tunnels [17]. Nonetheless, downtown Boston remains uncongested for the first time in generations. Now that downtown Boston's streets are open and urban form is transformed, the biggest challenge is working with the existing architecture and seamlessly weaving together the once-divided areas. This freed-up "no man's land" currently is zoned for the Rose Kennedy Greenway, a system of parks. Nonetheless, this vital area needs some serious thought. The citizens of the neighborhoods and the businesses of the waterfront have an opportunity to come together and enliven the city.

Investors and residents are responding positively to the infrastructure improvement. As the Boston Globe reported in 2004, "commercial properties along the old Artery increased in value by 79 percent in 15 years, nearly double the citywide increase of 41 percent" [17]. Owners have reconfigured buildings to open views where they once bricked up windows and are renovating property in other newly accessible

parts of Boston [17]. The North End's Italian restaurants are bringing back history as they once hid from the Artery.



Figure 2.8: Boston's new greenway park system, *Safdie Architects*, 2002 [21]



Figure 2.9: Rose Kennedy Greenway park system, 2009 [22]

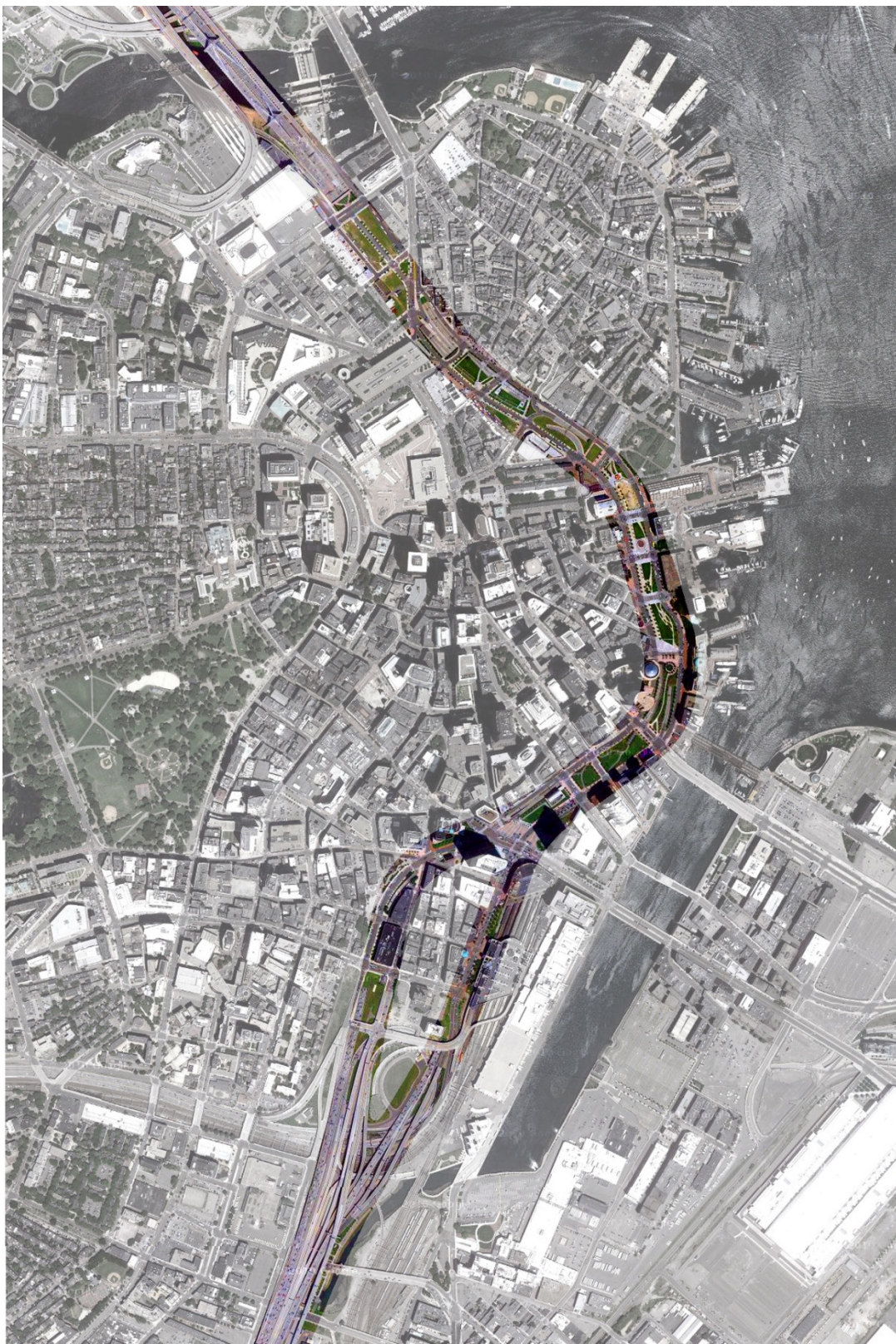


Figure 2.10: Satellite View of the Rose Kennedy Greenway [19]



Figure 2.11: Constructing the elevated highway, 1956 [2]



Figure 2.12: During its reign, 2000 [20]



Figure 2.13: And now the greenway, 2009 [22]

2.3.2 Manhattan, New York

The New York City parkway, originally intended to be a recreational road, enjoyed the luxury of a wide roadway, which kept it from the city's other roads and allowed grade-level access to be eliminated [23]. Furthermore, this roadway was curved to follow the undulations of the river and the surrounding topography without requiring excessive cuts and fills. The entire length of the parkway was landscaped to blend in with the surrounding parkland and prevent erosion, and a high standard of architectural design was required of all bridges and other built structures [23]. The city's first parkway, which opened to traffic in 1923, was immediately popular and led to the construction of more parkways in and around the urban area. [23]

The West Side Highway, officially named the Miller Elevated Highway in honor of former Manhattan Borough President Julius Miller, was part of the system of freeways created by New York's highway builder Robert Moses [23]. The stretch between Canal St. and 72nd St. was built between 1929 and 1936, connecting at 72nd St. with Moses' Henry Hudson Parkway [23]. Beginning in 1938, the highway was extended south of Canal St. to connect with the Battery, but construction of this stretch was interrupted by World War II and was not completed until 1948 [23]. Finally, in 1950, the highway was connected with the new Brooklyn Battery Tunnel at the south end [23].

Because it was the world's first elevated highway, there were no design standards when it was built. The West Side Highway's design was unsafe because of its sharp curves and its narrow lanes and entrance ramps [25].



Figure 2.14: The West Side Highway and The High Line rails (upper right), 1970 [24]



Figure 2.15: A ramp for the West Side Highway, 1974 [24]

The West Side Highway needed an overhaul soon after because of corrosion from weather and wear. In 1969, it was closed briefly when part of it collapsed, but it was quickly repaired [25]. Then in late fall of 1973, a cement truck going to make a repair on another part of the West Side Highway caused a 60 foot section of northbound roadway through Chelsea to collapse [25]. The highway was closed between the Battery and 57th St while engineers determined whether this section could be repaired. The ultimate demise of New York City's West Side Elevated Highway began here.

For the next 10 years, plans were made to replace the West Side Highway with the Westway, another interstate which would make its way along the west side of Manhattan. However, those plans were undoubtedly discarded with its billion-dollar cost estimations and political opposition in 1985 [25]. Moreover, just to repair the highway was estimated to cost \$88 million [25].



Figure 2.16: Map of the section of highway under repair and the neighboring, abandoned rail line, also elevated [25]

During the 1960s, citizen opposition stopped many of Robert Moses' freeway projects, including three proposed cross-Manhattan freeways, which would have torn up the city's urban fabric by demolishing swaths of land a block wide to build freeways crossing Manhattan [23]. The Westway was no different. Community opposition pressed.

Resistance to Westway appeared at all of the meetings where citizens were allowed to comment on the project and its environmental studies [25]. After the Army Corps of Engineers got its permit in August 1981, the Clean Air Campaign and other groups sued [25]. Surprisingly, in 1982, legislature stopped work on the project, on the grounds that the Army Corps of Engineers had not considered the impact of landfill on striped bass in the Hudson River [25]. After three more years, efforts were inadequate and the court still refused to allow construction to begin.

The city had survived for a dozen years without this highway. After such a long time without a freeway, Westway looked less like a replacement and more like a new freeway project extending into Manhattan, which would generate more traffic as new freeways do. In September 1985, New York City decided to abandon Westway [25].

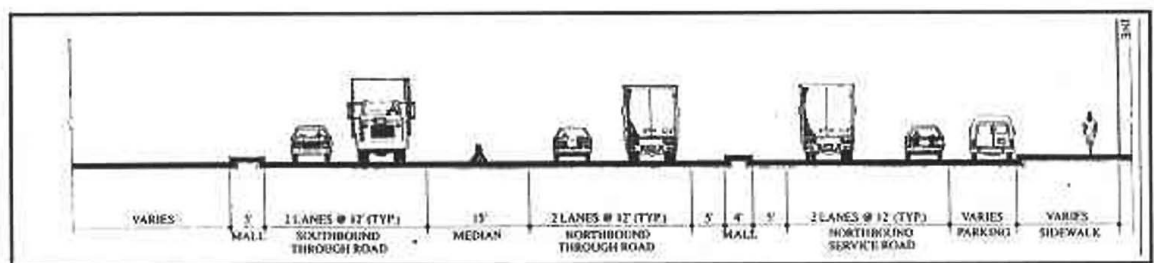


Figure 2.17: Cross-Sections of the roadway existing [24]

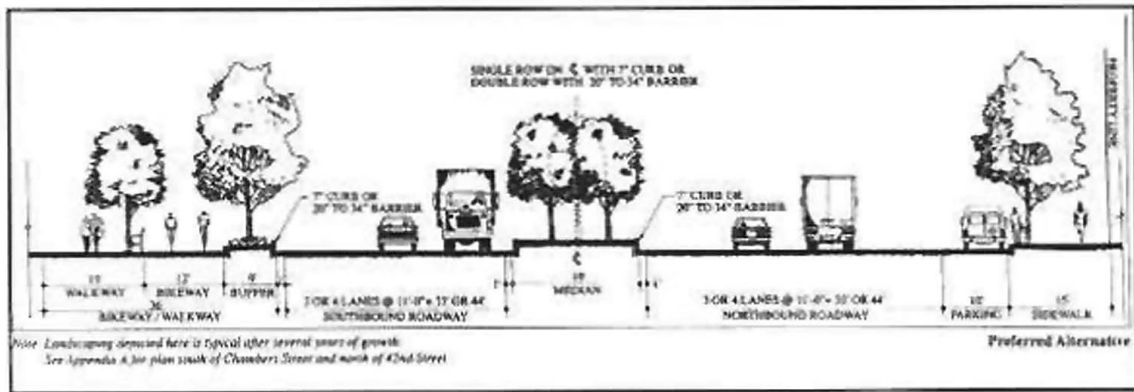


Figure 2.18: Cross-Sections of the roadway proposed [24]

Of the \$1.7 Billion in federal highway funds that had been allocated to build Westway, the city shifted 60% to improving mass transit [25]. It shifted the other 40% of these funds, plus an additional \$121 million of city and state funds, to the West Side Highway Replacement Project [25]. This project was capped at \$811 million, only able to make modest improvements to existing roads and to create a new park along the river [25].

It took a decade more before the sections of the highway were demolished. During that time, the abandoned road became a popular place for jogging and bicycling, and concerts were held there [23]. Seeing how the city was connecting with the decommissioned highway, the neighboring elevated railway, abandoned, held a new ambition. As the first repurposing of infrastructure of its kind in the United States, this railway now called the High Line, has been retained. The reconstruction process of a pedestrian parkway is nearly finished. Elevators and stairways provide access to it. The High Line has all of the essentials of any public park, with the added safety from vehicular conflicts. The elevated form may not cause social separation from its surrounds. However, it is too soon to tell.



Figure 2.19: Satellite View of the section through Clinton, 1990 [19]



Figure 2.20: And 2009 [19]



Figure 2.21: The High Line enters a former meatpacking building, 2004 [24]

In May 1993, the city finally adopted an alternative [25]. The project was completed in 2001; twenty-eight years after the West Side Highway collapsed and was closed permanently [25]. This project simply improved the existing West Street, which had originally been the bordering street to the Hudson River in the early twentieth century. It then became the street below the elevated West Side Highway [23]. By adding 19-foot wide landscaped medians, a bicycle path, and landscaped park along the river, these urban design elements emphasized the continuity of this street and park [25].

Most of this street contains four lanes in each direction. At 57th Street, it connects with a section of the original West Side Highway (or Route 9A) viaduct, restored at a cost of \$80 million, which leads to the Henry Hudson Parkway. The bicycle paths and parks are part of the planned East Coast Greenway [25]. They will ultimately connect with parks in the proposed Riverside South development below 72nd Street, which will

connect with Frederick Law Olmstead's Riverside, and ultimately with the planned Hudson River Valley Greenway extending to Albany [25].



Figure 2.22: The Hudson River Park Adjacent to Today's West Street, 2009

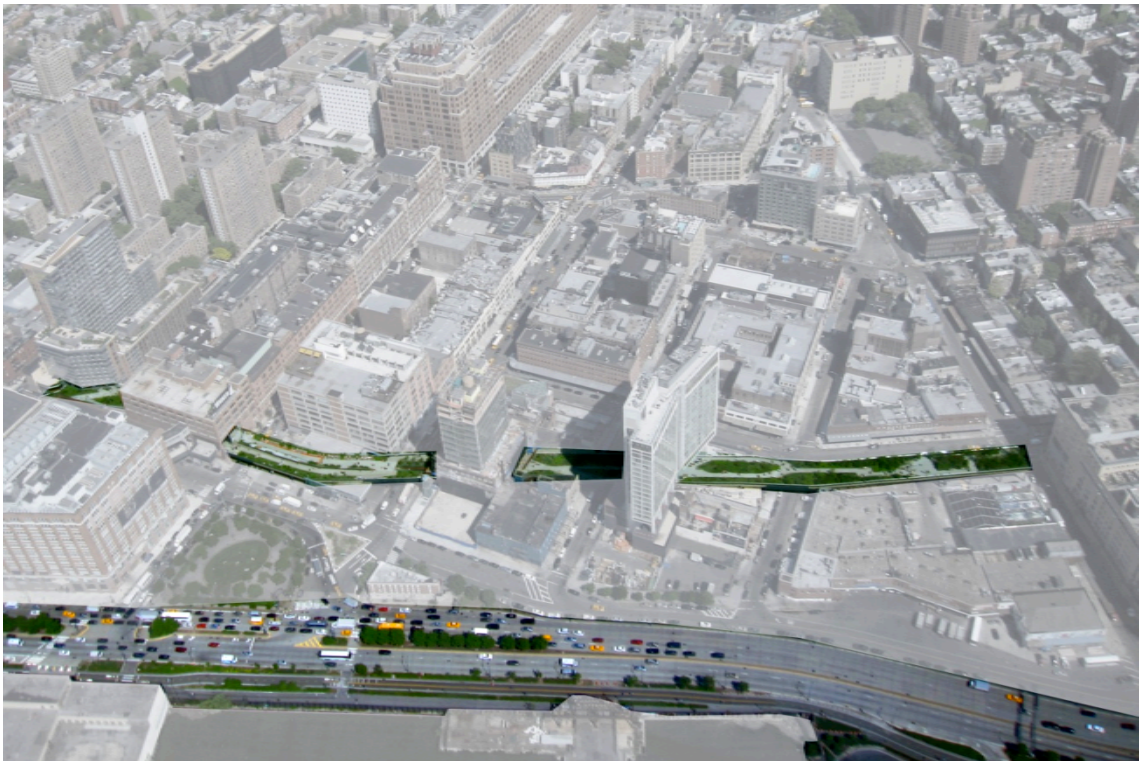


Figure 2.23: View of West Street and a finished area of the High Line, 2010 [19]

2.3.3 San Francisco, California

In the United States, San Francisco is the city most known for the positive effects on urban life from freeway removal. Two corridors in this city have been the start of this revolution: Embarcadero Freeway (now known as The Embarcadero) and Central Freeway (now Octavia Boulevard). The Embarcadero corridor lies on the eastern edge of downtown San Francisco intersected by the city's main downtown road, Market Street. The former Central Freeway traversed a first-tier ring outside of downtown San Francisco, serving a mixed-use corridor. The areas lie 2.3 miles apart [26].

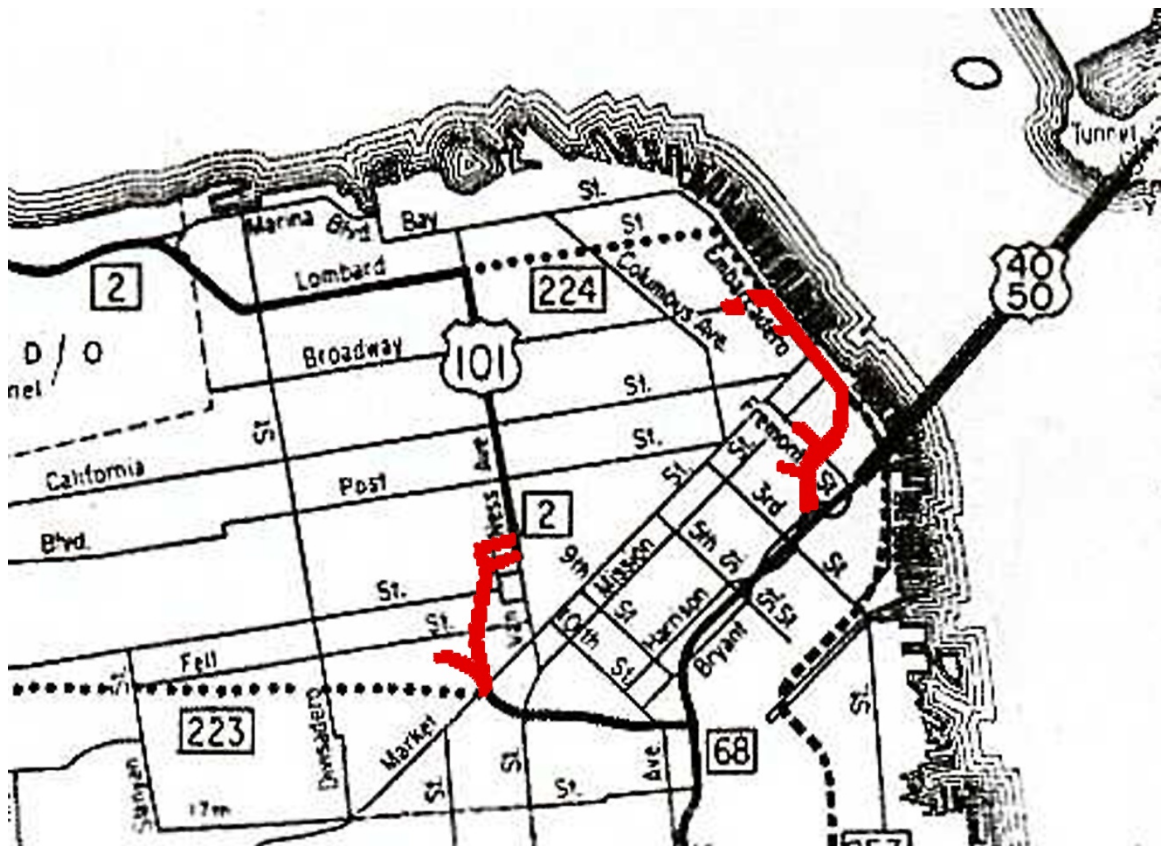


Figure 2.24: Partial map of the 1963 Thoroughfares in downtown San Francisco [27]
In red are the two corridors, Embarcadero on the right, Central in the center.

The Embarcadero freeway was 1.2 miles long. Its infamous stub along the water proved that the freeway had plans to expand [26]. The Central Freeway spanned through

the center of San Francisco, crossing over Market Street and connecting Highway 101 onwards to the Golden Gate Bridge. Both served as critical arteries in funneling motorists in and out of the city. News of additional freeway construction was seeing opposition as early as 1956 [26]. For the first time in history, proposals for seven of the ten planned freeways were canceled [26].

Then, in 1989, the Loma Prieta earthquake damaged the Embarcadero Freeway and other freeways in the Bay Area - reopening the debate about whether the city should remove or repair certain freeways. For San Francisco, demolition of these two elevated highways, along with streetscape enhancements, has radically transformed the city's downtown waterfront, creating an attractively landscaped, pedestrian-friendly corridor just west of downtown San Francisco.

Embarcadero Freeway



Figure 2.25: Original Path of the Embarcadero Freeway, 1989 [27]



Figure 2.26 Aerial View of Embarcadero Freeway, 1978 [28]

The Embarcadero Freeway was closed after the earthquake, and there were some temporary traffic snarls, but by the time the city made the decision about this freeway, traffic had adjusted to new conditions [26]. There was no gridlock with the freeway closed, so opponents lost their strongest argument for repairing it. In its place today: a waterfront boulevard with bike trails, parks, and public exhibitions.

After the freeway was removed, in 1991, real estate values in adjacent neighborhoods went up by 300 percent [26]. Entire new neighborhoods, oriented to the waterfront, were built and thrived in areas that had been hard to develop when the freeway stood as a wall that cut them off from the waterfront [29]. The corridor formerly occupied by a double-decked freeway has been transformed into a multi-lane boulevard flanked by a promenade of wide sidewalks, ribbons of streetlights, mature palm trees, historic streetcars, waterfront plazas, and sculpture gardens [28].



Figure 2.27: Demolition of the highway, 1990s [28]



Figure 2.28: The Newly Designed Embarcadero, 2006 [28]

Central Freeway



Figure 2.29: Original Path of the Central Freeway, 1989 [27]

Like the Embarcadero freeway, San Francisco's Central Freeway was partly built during the 1950s before it was stopped by the city's freeway revolt. All that was built was a highway "spur" [26]. Unlike the Embarcadero freeway, the Central Freeway was not on spectacular waterfront property, so there was not an early movement to remove it. But after the 1989 Loma Prieta earthquake, this freeway was also damaged and closed, inspiring a movement to remove it rather than repair it [26].

Removing the elevated Central Freeway and replacing it with a new surface street was a more drawn out, complicated process than with Embarcadero as the series of Google Earth aerial photos reveal [19]. The very northern section of the freeway

was demolished right after Loma Prieta because it was so damaged [26]. Six years later, more sections were removed so that an out-of-place off ramp was all that remained [19].



Figure 2.30 View from the neighborhoods, 1960s [28]

The battle over removing the Central freeway dragged on for many years. The main opponents of removal were residents of west San Francisco. Ultimately, the city decided to remove the Central Freeway and replace it with a ground-level boulevard, which opened up land for new housing and led to the revival of the surrounding Hayes Valley neighborhood [26]. A multi-way boulevard was a natural solution: a 133-foot-wide Parisian-style passageway with four central through-lanes, two peripheral lanes, and on-street parking [29]. A central median and side strips would provide safe haven for pedestrians— an important consideration given some motorists would be former freeway

users. By 2005, the construction was complete and the new urban surface street was named Octavia Boulevard [29]. Although the boulevard is well used, it is no more congested than the far larger highway that it replaced, showing that traffic responds the environment in which it is placed. However, recent study shows its transition from the highway to the urban areas could have been designed better. Pedestrians feel unsafe and neighbors are not as pleased with the aesthetics [26]. Thus, to accommodate increased traffic, city engineers introduced a dynamic signalization system that allowed “green waves” of traffic that formerly moved on elevated freeways to move swiftly along city streets used also by pedestrians and cyclists. Nonetheless, fast-moving surface-street traffic is a prime offense in the minds of many New Urbanists [29].

There was a lot of hyperbole about the traffic nightmares that would be caused by the removal of these downtown highways. Fortunately, these scenarios never materialized, though traffic congestion continues to worsen in San Francisco, as it has in all U.S. cities with growing economies [26].

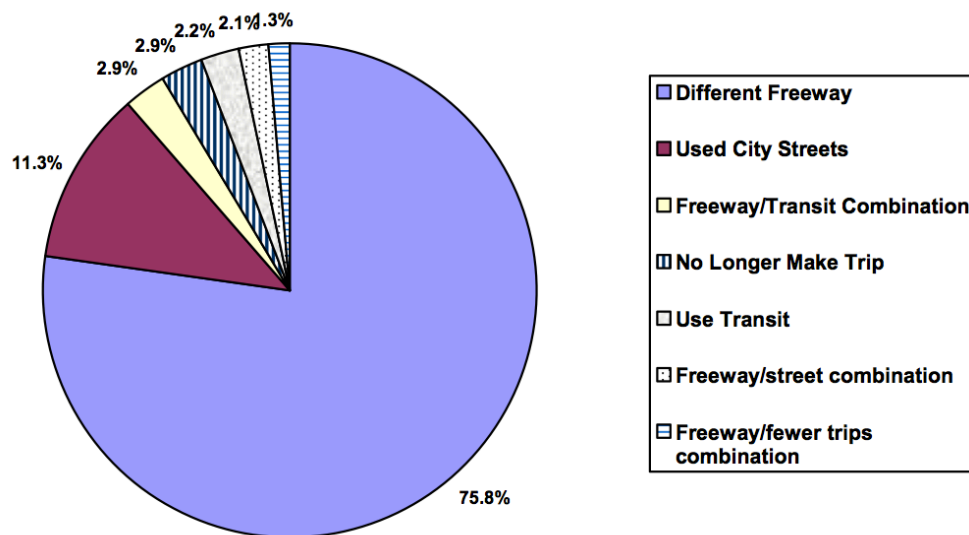


Figure 2.31: Source of Traffic Shifts Following Removal of the Central Freeway [26]

2.3.4 Milwaukee, Wisconsin

Milwaukee's Park East Freeway never reached the projected traffic capacities that it was built for [24]. It was a disruption to the street grid of the downtown area [24]. To restore the traditional urban form, the city made a proposal to remove the highway [24]. Land attached and adjacent to Park East would have a chance for a new zoning code of mixed-use development [24]. The highway was 30 years old and in need of repair. The cost of reconstruction was projected at \$100 million. Demolishing the freeway had a cost of \$25 million, with the federal government paying 80% of the cost.



Figure 2.32: The Park East was never completed and thus underused [24]

Because of its low traffic volume, the state dropped its opposition to removing the Park East freeway in 2000. Moreover, traffic volume was low enough that state transportation planners found it was not necessary to build a boulevard to replace Park East. It would be enough simply to restore the local street grid and to build a new bridge across the Milwaukee River. The choice was obvious. 26 acres of land were cleared for

new development. Surrounding areas have attracted investments of over \$300 million in new expansion.

A study found that the project would have even less impact on traffic than the original study predicted, because it offered better connections with existing streets [24]. This study also revealed that existing roads could easily accommodate the increased traffic [24].

Demolition of the Park East freeway began in June 2002 and was completed in April 2003 [24]. The reconstructed Knapp St. Bridge across the Milwaukee River and a restoration of the street ultimately increased connectivity to the waterfront [24]. In addition, restoring the street grid reduced congestion by dispersing traffic [24]. When there was a freeway, off ramps concentrated all of the traffic on three streets. Now, it is diffused to at least twenty four [24].

The city expects the freeway removal to bring over \$250 million of investment in the Park East redevelopment area [24]. \$140 million already has been invested and five new projects representing \$199 million are planned [24]. The freeway removal has also helped to stimulate growth in nearby locations that are not in the redevelopment area itself. On the former site of the Pabst brewery, a proposal including restaurants, offices, nightclubs, and 200 to 300 loft apartments is in the works.



Figure 2.33: A map of Milwaukee's urban framework for reconnecting, 1965 [24]



Figure 2.34: Proposed plans to the waterfront [24]

2.3.5 Portland, Oregon

During the 1960's, Portland's downtown was declining, similar to other central business districts throughout the United States [27]. This is at least partially due to the rise in construction of urban highways funded by the federal government. The housing supply and retail business in the downtown declined drastically [27]. The suburban-like mall, the Lloyd Center, opened in 1960, and business kept declining as more malls opened [27]. Downtown had few restaurants or events that attracted people to the district [27]. Furthermore, the city's air pollution was worsening, and the resulting fines threatened to bankrupt the city [27].

Originally completed in 1942, Harbor Drive was a four-lane freeway along the west bank of the Willamette River, cutting off pedestrian access from downtown to the river [27]. This public works project was funded by the Roosevelt Administration to stimulate the economy. By 1969, opposition was coming from all directions.



Figure 2.35: Harbor Drive and the west bank, around 1964 [27]

Portland made a decision to focus less on the private vehicle and more on pedestrians and public transportation [27]. In May, 1974, the state of Oregon closed Harbor Drive so it could use the land to build Tom McCall Waterfront Park, which would open up the waterfront to pedestrians, creating an important amenity for downtown [27]. Later that same summer, the Portland City Council decided against the Mount Hood Freeway proposal and instead used the freeway's federal funding to build transit projects [27]. Preventing this freeway eliminated all the freeway projects that were to follow [27]. A comprehensive land use plan in 1980 was adopted to establish an urban growth boundary and to concentrate development towards the public transportation system [27].

The state began closing portions of Harbor Drive after the Fremont Bridge was completed to carry traffic to parallel roads [27]. Within a few months the entire road was

closed and development of the park began [27]. This park opened in 1978 and a series of extensions to the park began [27]. Redevelopment around the waterfront was designed by a city-sponsored competition called the RiverPlace Project [27]. Completed in 10 years, 500 housing units, an 84-room hotel, 4000 square-feet of retail space, and a marina were added [27].

In addition to this development directly linked to waterfront, there is no doubt that replacing the freeway contributed to the overall revitalization of downtown [27].

Riverfront for People, the same group that led the fight to remove Harbor Drive, is now promoting a plan to remove Interstate-5 from the east side of the Willamette River, to stimulate similar redevelopment and smarter growth [27].



Figure 2.36: The RiverPlace Project along downtown Portland's waterfront, 2006 [27]

2.3.6 Seattle, Washington

In 1975, Freeway Park became the “deck-the-freeway” concept and began getting some serious attention. Because of the constrained geography of Seattle, Interstate 5 was environmentally damaging the area [30]. Traffic seemed to encircle the historical First Hill, a residential neighborhood [30]. The city of Seattle demanded a change and sunk the interstate into a trough that was capped over. Due to the Environmental Policy Act, the city’s bond initiative was forced forward [30]. Freeway Park opened in time for the 1976 Bicentennial Celebration and gained national recognition, becoming a model for other cities damaged socially and environmentally by their downtown thoroughfares [30].



Figure 2.37: The capping of the highway with the park [19]

Freeway Park is beautiful and memorable, but its design with the urban environment calls for improvement [30]. Acoustics allow for muffling the sound of the

highway below the park [30]. The complicated structural design must have a different set of standards because of the project's purpose as a pedestrian zone, not just as a roadway bridge. In addition, a capping project of this age has revealed high maintenance costs that continue to rise. The park also has some safety and design issues that the city is now seeking to resolve, such as better outdoor lighting and updating planters [30].

2.3.7 Duluth, Minnesota

In 1970, the plan for I-35 in downtown Duluth was designed to be located along the old rail lines [23]. The highway would help traffic bypass the downtown streets [23]. For environmental reasons this highway was due for reconstruction. Spray from Lake Superior onto the highway's southeast edge was a hazard [23]. To protect I-35 the proposed freeway would have to be elevated 20 feet into the air on concrete columns, creating a massive physical barrier between the waterfront and the city of Duluth [23]. A large concrete seawall would also have to be built to further protect automobiles from the weathering of the lake [23]. Furthermore, the plan called for a large interchange between the freeway and Lake Avenue right in front of the central historic district, which would have required the demolition of much history [23].

The city agreed for the need of the urban freeway; however, the downtown framework and life could be taking a back seat. Alternatives to the proposed design, such as relocating or burying the highway were far too expensive. During the redesign process, the citizens of Duluth who had long since turned their backs on the waterfront area rediscovered that Lake Superior was indeed a great asset to the community [23]. The freeway's design needed to emphasize "importance along the waterfront" [23].

The possibilities began to take shape and the idea of elevating the highway turned into a capping project, adding real estate. Due to the covering, traffic could be protected from the lake's spray [23]. Additionally, the park could be used to connect downtown Duluth to the waterfront, something that had not existed since the railway was introduced.

By the 1990s, Lake Place and its greenway were serving as a venue for the display of public art. Over one million dollars was spent on scenic enhancement of the freeway alone; landscaping and plantings along the freeway were carefully selected and arranged. Even the retaining walls had an aesthetic value, perhaps reminding drivers of what is above them.



Figure 2.38: The Jay Cooke Plaza and Tunnel in Duluth [23]

The Duluth story typifies the dynamics of the urban freeway in America. Architects, city planners, engineers, politicians, and anyone concerned about the urban environment must see to it that solutions like those in Duluth are possible [23]. More importantly exemplified, collaboration between these groups was attained.



Figure 2.39: A section of I-35 during construction, 1990 [19]



Figure 2.40: 2010 [19]

2.3.8 Seoul, South Korea

Beginning in 1925, the Japanese covered many of the Cheonggyecheon River's tributaries, converting them into covered sewers as part of a project to create an underground sewage system for Seoul [24]. In 1968, a road and elevated freeway were built above it. As years of neglect and development had left the stream nearly totally dry, water had to be pumped in daily [24]. Safety problems also occurred due to the deteriorated concrete construction. By the year 2000, the Cheonggyecheon area was considered the most congested part of Seoul [24]. Citizens agreed that the downtown's highway was the central source of the lack of connectivity to urban life and its removal would stimulate the area in a positive way [24].

After fifty years of debate, the river was uncovered— a sign of progress [24]. This “daylighting” is now a commonplace term for re-opening an urban waterway, hidden by man in the past [24]. Restoration of the Cheonggyecheon fit with the trends to re-introduce nature to the city and to promote a more eco-friendly urban design [24]. Other goals of the project were to restore the history and culture of the region, and to revitalize the economy of Seoul. The Seoul Metropolitan Government established several organizations to oversee the successful restoration. Freeway demolition began in June 2003 and both the removal and the excavation were completed in September 2005 [27].

The Cheonggyecheon daylighting revealed the natural environment and the historic resources of Seoul, reinforcing the surrounding businesses. The river was the vital part of the campaign for highway removal. To relieve congestion problems, Seoul began constructing its first Bus Rapid Transit line underground [27]. Pride and balance have been rediscovered in this Korean city [27].



Figure 2.41: The Highway in downtown Seoul, 1990s [24]



Figure 2.42: The restored Cheonggyecheon flows through the center of Seoul [27]

The projects discussed here have proved that the game has changed for downtown highways. Although each city is quite different, all of these case studies are proving to be a part of a restoration process. Each project was an attempt to undo previous damage to the urban fabric, to correct mistakes, and each aimed to reach goals to enhance pedestrian connectivity and strengthen economic vitality. The primary lesson is that highway alterations clearly must be related to a broader urban design process. Highway alterations, just like highway design and building, must be part of a more comprehensive process and strategy. The evidence from the history of highway design and buildings, and from the case studies, is that single purpose highways are a thing of the past. (Refer to Appendix B for additional photos of the case studies.)

CHAPTER 3

ASSESSMENTS

Restoring sustainable urban form by altering urban highways has been the primary motivation in the various strategies for demolition, removal, relocating, etc.. Whether concealed under the rubble, such as in Milwaukee's case, or revealed when a waterfront was opened up, the objective was to restore or reconstruct sustainable, walkable, connected urban form.

Seven urban design strategies have been drawn from the case studies and the comprehensive project listing. Each of these alternatives presents a conceptual way to solve a given highway situation. Each integrates proposals for road and infrastructure reconfiguration with public transit and pedestrian solutions, design of the public realm, and redevelopment opportunities. Certain conditions set the stage for what makes each solution workable.

3.1 Bury

Highway removal, or in this classification, a highway concealment, immediately opens up land adjacent to and on the surface of the former highway. These rights of way and adjacent areas have become social and physical deadzones. But when they are repurposed, the deadzones can restore the previous urban form and make adjustments to the previous form for contemporary uses.

In Boston's new Greenway over the buried highway, buildings that once turned their backs on the old Central Artery are now beginning to open up toward the Greenway, creating new entries in buildings and opening up boarded windows. Only three years after

the reopening of Boston's downtown streets, the new land and frontages are continuing to develop and mend the wound of the Central Artery. There was urban life before the Central Artery plowed through the city. A historic framework was already in place to work with.

In the future, the cost of burying a highway will be a primary consideration and a likely constraint. The critical question is whether such a project is worth the cost, both of construction and long term maintenance, which will always be greater for underground highways. Will Boston, for example, find the tunnel to be a wise investment in the long term? Will the benefits outweigh the costs? Skepticism remains in Boston.

Seattle hopes to redesign its Alaskan Way Viaduct, an elevated highway that stretches along the harbor's coast. Initially placed there in 1959 to serve industries and downtown access on relatively inexpensive land, the freeway cuts the waterfront off from the city. Maintaining the aging Viaduct is costing the city more every year. One alternative was recently proposed to bury the highway and open up the waterfront for public and private development, with the cost estimated to be \$5 billion or more.. Boston's experience with the big dig was a major reason citizens of Seattle disapproved. Still open to ideas, the City continues looking for ways to remove the highway. Its structural corrosion is an eyesore and a safety concern. When burying the highway failed public approvals, the current idea is to create an at-grade boulevard, which involves shifting traffic to other modes for transportation. This is a case where one strategy failed, which led to the pursuit of another strategy.



Figure 3.1: The Alaskan Way Viaduct in Seattle, 1976 [30]



Figure 3.2: The Tunnel for the Central Artery, 2008 [19]

3.2 Demolish

Removals prove to be a fraction of the direct cost of highway burial or other strategies for alteration. However, real savings occur only when the highway is actually no longer needed, otherwise new investments in other roadways or transit will be required. An advantage of highway demolition is the right-of-way can be filled with a variety of programs, and the reuse possibilities are many. However, the reuse planning must be an integral part of the urban design strategy for the removal. Measuring costs and benefits remains the key factor.

Portland, Oregon chose to remove a highway and to make a park and a mixed-use development, with planned transit replacing auto usage. On the other hand, Seoul, Korea chose to daylight a river flowing where the highway had been. San Francisco demolished the Embarcadero freeway and opened up the existing waterfront, extending a boulevard and parks, while the area continues to take shape with developments for mixed-use.

Until recently, making changes to downtown highways was focused on increasing road capacity and speed and decreasing conflicts. Safety and convenience for one mode of transportation, the private vehicle, set the standard. Removing a highway seemed entirely wasteful. Auto-drivers, especially, resisted any change that decreased highway capacity or convenience. This makes a demolition strategy the hardest to carry out because it requires a change in day to day life for many people, not all of whom will benefit from removal. It is important to note that all of the highway demolitions cited in the case studies are in densely packed urban areas where other highways and reliable and convenient public transportation options are available.

With more advanced understanding and consideration for the dynamics of traffic movement, congestion, and the expansion of transit, downtown highway removal may prove to be the smart move. Demolition not only has a small price tag in comparison to other strategies, but new real estate development can bring in substantial investments, in some cases enough to pay for the removal itself. Additionally, public spaces created may have important civic value.

3.3 Tame – Highway to Boulevard

Although this involves a demolition of the highway, the right of way is reused for automobile access purposes instead of other, non-highway or non-transportation uses. Instead, the right of way is converted into a boulevard. Speed and single purpose movement is altered to plan for multi-purpose movement including automobiles, pedestrians transit, and bicycles, creating public spaces, and providing greater connectivity. The design of a wide median can be used for a potential transit system. For Paris's inner peripherique boulevards the medians were used as rest stops (with benches) and as a safe haven for pedestrians before the city's tram was fully constructed. If designed well, an at-grade boulevard can even reduce crime [12].

A boulevard cannot just be seen as a street. The right-of-way is essentially a linear park with precise intentions. Barcelona's Avinguda Diagonal is one of the main avenues of the downtown area. Its width allows for a number of programs to exist. At its widest, lanes for through-traffic are separated by lanes for local traffic. Transit is in the median and sidewalks are spacious. Interestingly enough, Avinguda Diagonal turns into a freeway as it exits the city.

Chattanooga, Tennessee has increasingly turned its attention to orienting recent downtown investments toward the Tennessee River. Doing so required replacing Riverfront Parkway with an urban boulevard and, subsequently, creating new waterfront open space. Chattanooga's downtown grid was integrated with the boulevard, thereby creating pedestrian connections and new development parcels. By the 1990s, Riverfront Parkway no longer served its initial industrial use. In fact, the parkway had excess capacity. Its redesign was not an issue of accommodating traffic, but rather calibrating its dimensions for current volumes. Lanes were reduced to two, except for downtown, where it has four. Two additional downtown intersections were added to disperse potential congestion.

For much larger United States cities, The West Side Highway in Manhattan and the Central Freeway in San Francisco are the two classic examples of *taming* a highway into a boulevard. Both elevated highways were damaged by natural causes. However, the initial removal of these highways became a lengthy process, both ranging 20 to 25 years. Once removed, each project took less than five years to become a boulevard. Additionally, today both are in the maturing process and adjacent real estate values have increased.

"Highway to Boulevard" is essentially the most cost effective. It uses the same framework laid out by the demolished highway. It is easiest to maintain. However, in terms of investment, little or no new real estate is created. But property values on lots adjacent to the new boulevard would rise. As with any project, time is a major constraint to have all stakeholders agree to a proposal.



Figure 3.3: Before the Removal of the West Side Highway, 1974 [24]



Figure 3.4: West Street today, 2009

3.4 Partial Capping / Bridging

In the United States, cities are increasingly placing freeway segments below grade and covering them with parkland and street. Whether called capping, decking, bridged, or lid shut, this is the most popular form of highway reconstruction. As automobile impacts become more and more disruptive, capping and bridging are now not only accepted but are *expected* [30]. . Projects where freeways are already below-grade are much more feasible than others, as in Phoenix, Arizona and Cincinnati, Ohio. Other examples show where newly constructed highways build the caps or bridges while the roadway is being completed.

Cut-and-cover tunnels have helped to integrate highways into cities. They are less visible and some streets can continue overhead. The highway may still be blight, but the city can still be connected. Careful use of topography can blend the freeway into its surroundings [30]. By physically marrying the freeway structure with architecture, the freeway becomes part of the urban fabric. However, the direct marriage of freeway and building is rarely practical, due to costs for long span structures and noise, vibration, and security issues. Noise and vibration has become an issue in Seattle's Freeway Park. In Atlanta, Georgia an office complex is built directly atop a section of freeway north of the downtown. However, the structure is not woven into the fabric of the city; rather it became a divisive element [30].

The latest highway caps have been New Jersey's innovative highway redesigns in Trenton and Atlantic City. Real estate values doubled around the developments. Buffalo, New York's "Skyway" has seen fierce debates over what to do with their urban freeway.

With political disagreement on a complete demolition, bridging over to the waterfront is a compromise to maintain road capacity while freeing up land.



Figure 3.5: Trenton, New Jersey's Riverwalk over US 29 - \$150 million [30]

3.5 Retain and Ameliorate

The alternative to retain an urban freeway represents a continuation of the *status quo* with respect to maintenance costs and traffic volume, except in the case of ameliorating. By ameliorating a highway, it is maintained but modified—enhanced and improved. This sub-classification simply makes the design embrace the existing structure and its form as an opportunity, leading to innovative approaches and a visually distinguished urban space [33]. Like the design of the High Line in New York, amelioration integrates landscape with an iconic industrial-era elevated rail structure.



Figure 3.6: A view from below the viaduct in Paris [33]

The Viaducs des Arts in the heart of Paris, France changed the face of an elevated railroad to a Promenade Plantée with retail space below. The brick and masonry structure was constructed in the nineteenth century. The railroad closed in 1969. Fifteen years later, the city's urban design agency developed a strategy for the viaduct. Demolishing the viaduct would create the difficult task of redesigning and rebuilding an entire corridor, into the adjacent historic streetscape. The decision to retain the viaduct and promenade allowed the design to emphasize the structure's character and visual connections to the city. The archway restoration maintains historic identity. It has become an asset to the area, stimulating new investment in housing and commercial buildings.

The Viaduc des Arts demonstrates a potential benefit to retaining existing infrastructure and how it may be successfully integrated into the public realm. The Promenade Plantée illustrates how potentially incompatible programs might co-exist in

the same place [33]. The tranquil elevated linear park is separated from the bustle of the retail street below.



Figure 3.7: The Shanghai Street Greening [33]

The greening of overpasses in Shanghai, China uses landscape planters to enhance visual quality of elevated highways. For Carrasco Square by West 8 in Amsterdam, varying surface materials activate the space under an elevated rail. Also in the Netherlands, a city has discovered an affordable means of retaining by ameliorating underneath the highway in the suburb of Zaanstaad. This unique strategy placed recreation, retail and public space below a freeway with a total cost of only \$3 million. The function of the highway remained unchanged, but it created the opportunity to reconnect two neighborhoods. The under-highway development is heavily used by both neighborhoods and has stimulated new investment along its length. There are many

examples of using under-highway space. Their success depends on careful planning and integrating new programs with the surrounding neighborhoods.

3.6 Relocate

Relocation moves a freeway to another area within or outside the city. Essentially rebuilding, burying, or elevating a highway has the same affect. Beginning with demolition costs, relocating the highway means new construction as well as clearing of the new site. Some of the structure could be transferred to the new location cutting material costs. Yet repairing a highway is most often cheaper than relocating it. For this reason, the Central Artery project in Boston can be thought of as a “virtual freeway relocation” project [30]. Plans are being made to relocate a highway in Providence, Rhode Island twenty miles away. Funding is the issue pending. Rhode Island might take a closer look at ways to disperse traffic and avoid the expensive compromise of building another freeway.

3.7 A Typology To Guide Urban Design Projects

This typology, drawn from the case studies and wide range of projects, is a first attempt to categorize the variety of highway alteration projects as a way to set our alternative urban design strategies. This typology should be seen as a first effort that can be further developed, considering the very specific issues raised for each type. For, example, one type could be examined across all of the known projects in order to collect detailed traffic information for before and after. In addition, total project costs could be identified and compared. Other issues like the design and complications of public approvals could be examined from the local to the federal levels. This typology can be considered a framework for future research.

CHAPTER 4

ATLANTA AND THE DOWNTOWN CONNECTOR

The previous chapters set the stage for the *rethinking* the City of Atlanta's Downtown Connector, the segment of Interstate 75/85 that passes through central Atlanta (figure D.1). Every city has a unique series of design challenges formed by a collection of layers, each with its own history. This history in Atlanta begins with the trails laid out by Native Americans along the Peachtree ridge, continuing through Atlanta's role as the Southeast's largest railroad hub, which invited the city's destruction during the Civil War. The last century added two more layers: the airport that grew to bind Atlanta and the Southeast to global trade and the global economy and the Downtown Connector that grew to Atlanta's highway system – I-75, I-85, I-20, I-285, Georgia 400 and many more. In Central Atlanta, highway construction and urban renewal combined to shape the city during the last half of the 20th Century.

Toward the end of the 20th Century, the City of Atlanta began a renaissance, focused mostly in older neighborhoods near downtown and, later, in Midtown and Georgia Tech. The beginning of the 21st Century presents opportunities for continuing and expanding that renaissance. Perhaps the greatest challenge to the future of Midtown and Georgia Tech is the Downtown Connector. The question is whether the Downtown Connector should remain as it is, be removed, or be altered in some way to adapt to a city that increasingly wants to be walkable, transit oriented, connected, and livable in sustainable ways. This chapter sets out the background of the Downtown Connector and

then draws on the previous case studies and design strategies to suggest urban design approaches.

4.1 Background

William B. Hartsfield was Atlanta's mayor from 1936-1961. He coined the phrase "the city too busy to hate" when describing Atlanta in the 1950s [31]. Racial problems in Atlanta were only beginning to be dealt with. His term in office was during a time of radical social change in the city. He "had the foresight to recognize that an expanded coalition reaching across racial lines could be put together" [31]. Biracial agreements begin to form and the mayor's relationship with the downtown business elite gave him even more power [31].

The African-American population grew quickly. Continuing to separate land use and neighborhoods by race was becoming impossible [31]. Throughout Hartsfield's term he made efforts not to displace any citizens of Atlanta in this era of social transition [31]. Nonetheless, the downtown business elite had a prominent voice in his decision-making and the future of Atlanta's downtown [31]. In his first phase of physically restructuring Atlanta, his alliance with business leaders led him to believe that preserving the central business district was key to Atlanta's economic future. [31].

Making Plans

Universally referred to as the document that set the future of Atlanta's highway system, The Lochner Plan, prepared for the Georgia DOT by the H.W. Lochner Co. and DeLeuw, Catherand Co. in 1946, had its basis in the belief that highway and transit expansion was a key to Atlanta's economic prosperity. In 1946, voters approved a bond issue to implement the Lochner Plan.

The downtown business community in Atlanta, like downtown groups across the country, strongly supported highway building as a way to link suburbs with downtown businesses. Early plans for an expressway to pass west of downtown would have minimized residential displacement and actually cost less. However, the Lochner Plan, which the business leaders strongly supported, recommended the new expressway lead directly to downtown [31]. The Lochner Plan argued for the new highway to connect the suburbs directly to downtown, but it also had another consequence: it was to buffer African-American residential neighborhoods from the central business district [31]. For Hartsfield to get everyone on board he had to promise displaced residents homes through new public housing projects and other various neighborhood improvements. [31]. Thus, highway building and urban renewal were joined in the remaking of downtown Atlanta. [31].

Despite city planners' calls for "society-first" freeway planning during this time, Harland Bartholomew's work in the mid-1950s reflects the victory of a traffic-service orientation of traffic engineers in the struggle to design and build urban freeways [5]. Bartholomew's 1954 transportation plan for Atlanta proposed a grid of small highways to be built. The basis of the plan was a distribution of traffic to multiple highways reducing future congestion on the single, federally funded highway through Downtown. The plan continued to refer to Bartholomew's cautions about coordinating transportation and land use that characterized his work from the 1920s to the 1940s and it also contained an explicit emphasis on the facilitation of high-speed vehicle travel within the urban area [5]. "The element of rapid and uninterrupted travel is the objective" [31].

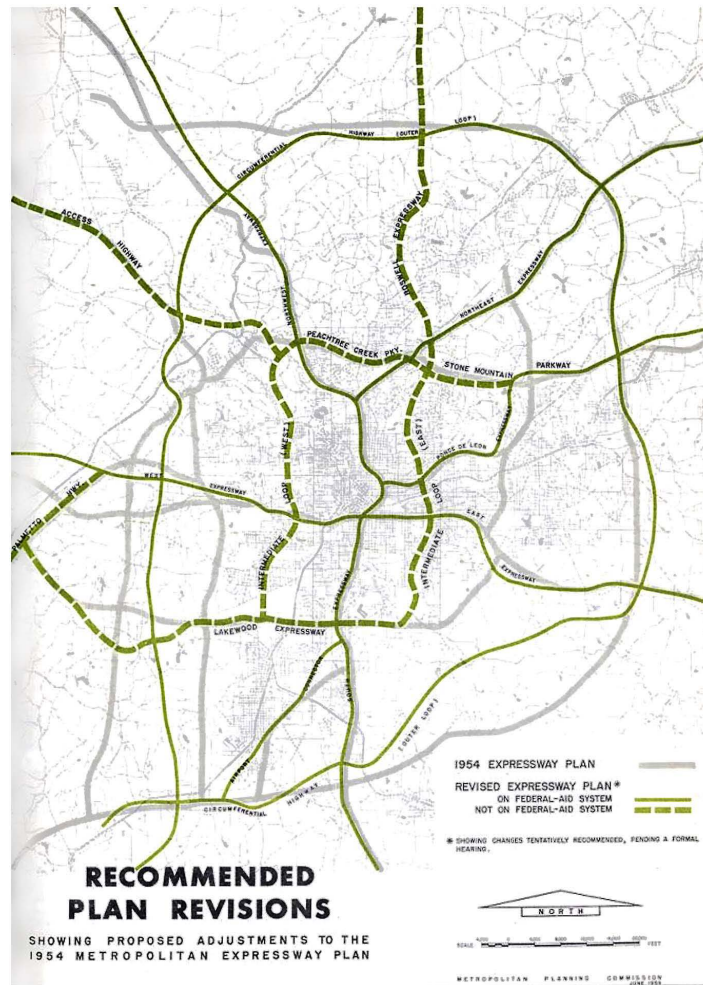


Figure 4.1: Adjustments to the Metropolitan Expressway Plan of Atlanta, 1954 [32]

Bartholomew cautioned engineers in the routing of the new expressways, but his recommendations aimed toward the same goal as that of the engineers: “move more cars faster” [5]. Other modes of transportation played little to no role in this narrowly focused plan. He knew whomever had the money held the reins.

The belief of the times was that expressways were a method to stay economically competitive and an approach to clear blighted areas. By 1969, over 122 miles of freeways in Atlanta were opened, most of which were just two lanes in each direction. Originally, it was thought that a perimeter beltway would define the limit of urbanization. By the

time the beltway was completed, suburban development had spread well beyond it in all directions, eliminating the possibility of using it for an urban development boundary. In 1971, the Vorhees Plan suggested a startling addition of freeways, including a need to acquire the right-of-way for another, larger perimeter highway. Although never implemented, the idea was not completely forgotten. The Vorhees Plan also defined the route of Georgia 400, which was eventually built from the northern suburbs to Buckhead, but not the planned extension into the center of the city in the early 1970's. That right of way is now Freedom Park, with one segment including Freedom Parkway. Since the 1970's, the focus has been on attempts to reduce congestion by widening existing highways with more lanes, high design speeds, and minimal frills.

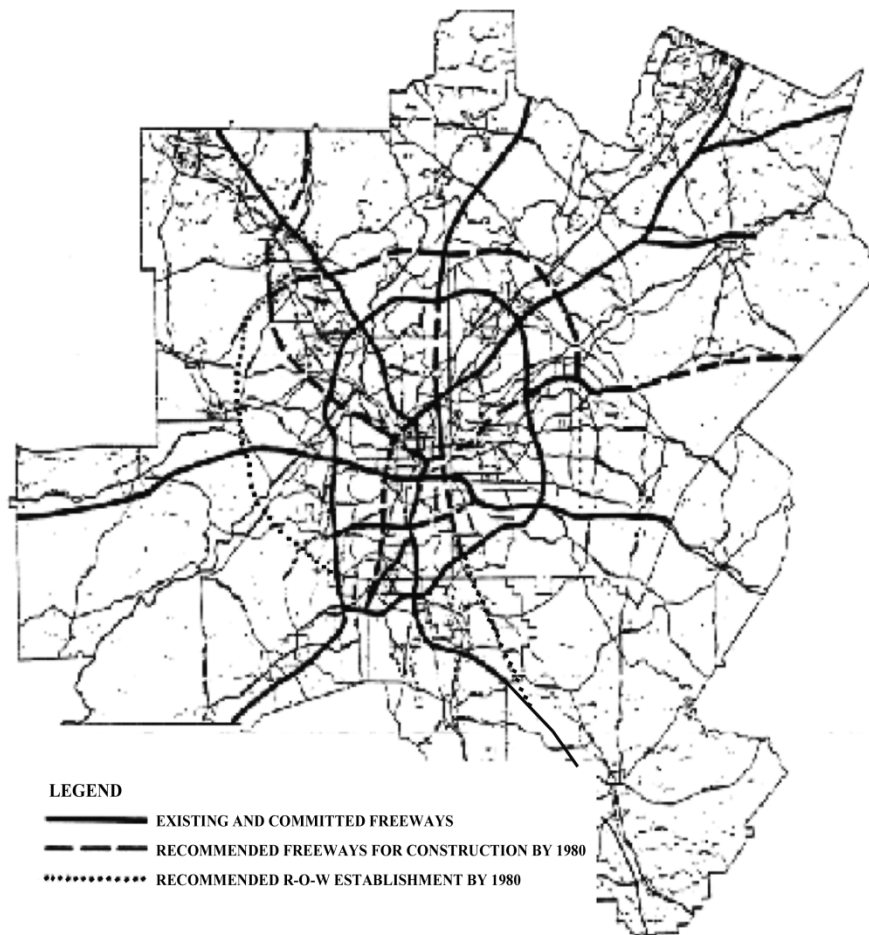


Figure 4.2: The Vorhees Plan for Atlanta, 1971 [32]

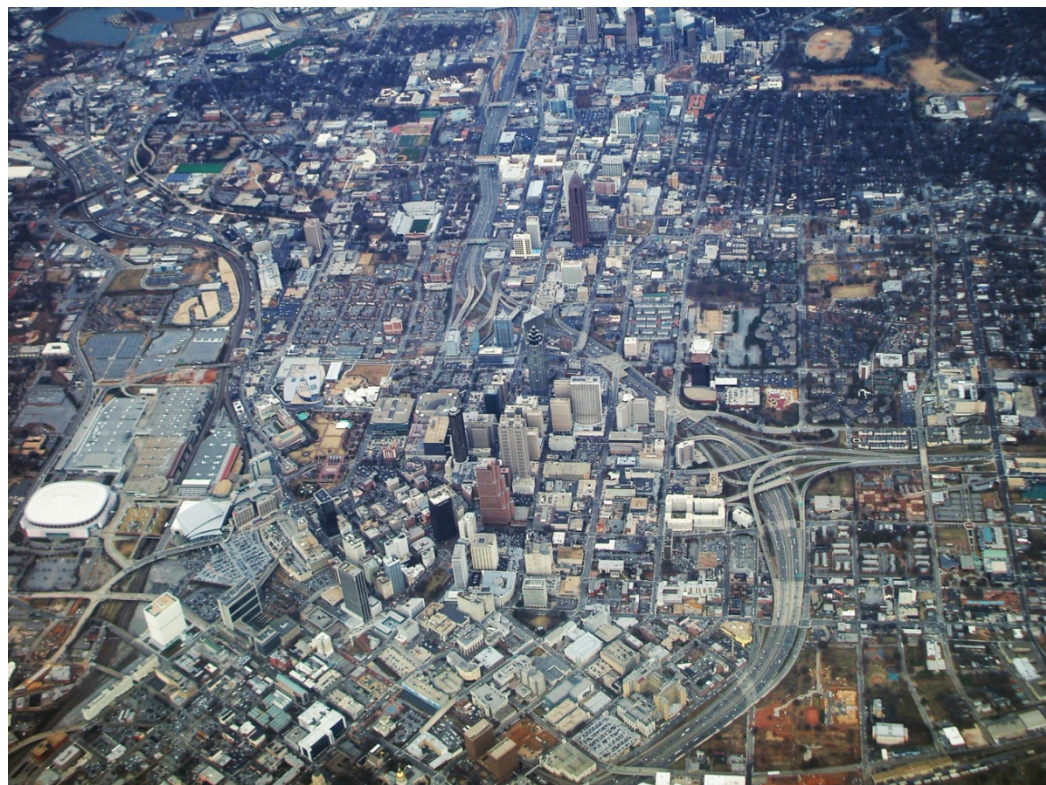


Figure 4.3 and 4.4: Aerial views looking north, 1951 [32] and 2007



Figure 4.5: Looking north towards the capitol, 1955 [32]



Figure 4.6: The same area just ten years later, 1965 [32]



Figure 4.7: View of the Skyline from the 5th Street Bridge, 1964 [32]



Figure 4.8: View of the Skyline from the 5th Street Bridge, 2009 [25]

(Refer to Appendix C for additional historic photos of Atlanta)

4.2 Transportation Issues

Atlanta is caught halfway, between its traditional sprawling self and a more upscale urban metropolis. The city offers neither the pedestrian and transit-oriented life of its status-seeking competition, nor the sophisticated urban living of a matured American city. Atlanta is a new city, built during the era of the automobile, highways, and urban renewal. Sprawl characterizes the vast majority of the urban area. The automobile is the only means of access – to work, to school, to shopping, to parks, or to any of the conveniences of everyday life. Funding continues to flow to highway projects, with the belief that congestion relief is just around the corner with the addition of yet another added lane.

Atlanta's inner city – the areas immediately around downtown – has begun a renaissance. Significantly, this is the area of the city that was built either before the automobile or during the times when the auto shared streets with pedestrians, trolleys, and busses. It has the traditional urban framework of streets and blocks that the vast majority of Atlanta lacks. It is also the location where the MARTA rail and even the bus systems work best. Finding solutions to transportation and building a livable city for the entire urban area is difficult to imagine. However, there are real potentials in the inner city for change. That has already begun to the north in Midtown and around Georgia Tech. However, this is also the place where the Downtown Connector splits the city and blights its edges.

Robert Moses, Harland Bartholomew, and others prescribed a solution for traffic planning – fast and unimpeded movement and elimination of congestion – but that solution has become the problem. As cities grow over time, congestion will remain. The

key is to address the problem in the broad sense of planning, where traffic planning is balanced and coordinated with transit, with making neighborhoods walkable, and with building mixed-use neighborhoods. Atlanta, and other cities like it, may not have the opportunity to change the entire urban area, but possibilities in older areas are very real. The case studies in Chapter 2 are almost all located in areas where the conflict between a highway and traditional urban form was present.

The location of the Downtown Connector was not ideal when it was built, with three lanes in each direction. Moreover, the continued traffic-engineering-oriented strategies for congestion relief have now made the Connector a total of 14 lanes wide. With rush hour getting longer and longer every year, proposals are under discussion to build a tunnel or to double deck the connector – both of which are continued attempts to reduce congestion by adding more lanes.

4.3 Recommendations

4.3.1 Process

Atlanta had a strong period of growth throughout the 1990s. Hosting the Olympics in 1996 helped boost the city's identity and initiated changes. Atlanta — at least the area around downtown — is becoming a new kind of city. The question is this: what is next?

There are three initiatives that promise to move Atlanta forward. First is the prospect of funding for transit as well as needed highway improvements. For the first time since the sales tax referendum in the early 1970's to build MARTA, the region will vote on a sales tax referendum for transportation improvements in 2012 or earlier. This will potentially provide substantial funding for transit in the region. Second, the Beltline

project, transforming an old rail beltway into pedestrian-oriented developments, is still a stimulus to in-town living and business. As it evolves, and adds transit, it will attract more residents and businesses to central Atlanta and make Atlanta more livable and accessible. Third is the realization by the Federal Government that transit needs funding. All three of these coming together will provide an opportunity to address the Downtown Connector.

Two important key conclusions from the case studies should guide Atlanta. One key emphasizes this: any proposal to address urban design or transportation issues – like the Downtown Connector – must be inclusive. Planning for traffic is no more important than planning for transit or pedestrians or bicycles – and for future public space, private building design, and land uses. Recent moves to coordinate the Departments of Transportation, Housing and Community Development, and the Environmental Protection Agency at the Federal level should be replicated in the State of Georgia and the City of Atlanta. No longer can decisions be made that are single purpose. That is the legacy that resulted in the Downtown Connector in the first place.

A second key brings the focus on reducing traffic demand, an idea that is gaining credibility, given that adding highway capacity is increasingly difficult – including cost and neighborhood resistance – and that increasing capacity in highly auto-oriented urban areas actually results in continued, if not increased, congestion. Reducing demand requires a comprehensive approach – combining transit improvements, a more dominant pattern of mixed uses to reduce travel need. This could mean altering schedules to spread travel demand through the day and week, and other moves that are beyond the scope of traditional traffic planning and engineering.

4.3.2 Design

The typology in Chapter 3 sets out six types of actions for addressing urban highways: Bury, Demolish, Tame, Partial Cap or Bridge, Retain and Ameliorate, and Relocate. All six of these options should be considered for the Downtown Connector balancing the larger and more important overall urban design and transportation issues.

The first consideration, however, is to understand the present situation for both traffic issues and local context. Regarding traffic, other than peak hour congestion, the Downtown Connector is no longer a primary route to downtown Atlanta. Instead, it is a through traffic route for the metropolitan as well as the southeast region. It is estimated by some that more than 50% of the average daily traffic originates outside the I-285 Perimeter and reaches destination outside the I-285 Perimeter. Regarding the local context, topography is a constraining factor as the highway passes parallel to the Peachtree Ridge and then descends below grade and under Peachtree Street and the Ridge. The Connector also is situated oddly in relationship to the multiple grid frameworks of central Atlanta, making the route through the city at least as complex as the Central Artery in Boston.

Clearly, the eight-mile-long Downtown Connector would be first divided into smaller parts (figure D.1 maps four segments of the Downtown Connector). The northernmost section runs through Midtown on the east with Atlantic Station and most of the Georgia Tech campus on the western side. The stretch is 1.5 miles long. The northern tip is defined as the location where interstates 75 and 85 meet, at 17th Street. To the south, the North Avenue Bridge will mark the segment's end. The southern section includes the Grady Curve. This section is mostly below grade with street crossings above. Near the

State Capitol building, the highway retaining walls are structured to accept a cap at some point in the future. Most of this southern section of the Connector could be capped in the future. The following discussion will focus only on the northern section, because that is the most complex situation and most in need of action.

The topography of the northern segment undulates, going below grade at the 14th, 10th, 5th, and North Avenue bridges and rising in between. It is at grade along most of its west side until the southern portion where it dips below grade and remains below after passing the North Avenue bridge. On its eastern edge, it begins below grade much sooner from 14th Street southward and is especially low at each bridge (figures D.2.1 - D.2.6 diagram existing conditions of the Connector and figures D.3.1 – D.3.4 analyze four design strategies: bury, tame, cap and bridge, and retain and ameliorate).

Burying the Downtown Connector is an unlikely action. First, the cost and time, as demonstrated by Boston's Central Artery and the defeat of the Alaskan Way Viaduct highway project in Seattle, indicate that such a major and costly project would not be approved. In addition, lowering the Connector would disrupt traffic due to lane closings. It is unlikely that the public – commuters, businesses, and others – would allow such disruption. There are no logical alternatives for even reduced travel demand. Although burying would be the best solution for traffic engineering purposes, and perhaps could increase capacity in some manner, it is not realistic. Funds of that magnitude would better be spent on other transportation modes – MARTA expansion and improvement, commuter rail, and light rail.

Taming the Connector – converting it into a multi-lane boulevard – could be a long-term strategy, but this would depend on coordination with many other actions to

reduce and relocate demand. Through traffic – that originates and ends outside the I-285 Perimeter – would have to be re-routed to the Perimeter itself. Transit demands would require implementation with major facilities, including light rail, commuter trains, and additional MARTA trains. The possibility to reduce demand enough to convert the Connector into a multi-lane boulevard would be more feasible. Instead of burying the Connector, it would need to be filled so that intersections between the boulevard and 14th, 10th, 5th and North Avenue would be at grade intersections. Taming is the best choice from an urban design perspective for Midtown and Georgia Tech. The excess right-of-way could be developed with new buildings, their front entries facing the proposed boulevard, giving Georgia Tech and Midtown a dynamic fresh face and a new presence in Atlanta. The hurdles would be great, public resistance from automobile drivers would be fierce, and business interests would be sure to rebel against it. The first step in such a project would have to be public education to create a collective movement equal to the citizen movements that stopped other highway projects.

Capping and Bridging has already started with the project that widened the 5th Street Bridge. However, that was a modest approach to what would be possible if the desire to connect Midtown and Georgia Tech were strong enough. The North Avenue Bridge could easily be converted into a wide cap that might contain new Georgia Tech facilities. The 5th Street Bridge could be widened substantially. The 10th Street and 14th Street bridges could be made into caps as well. Capping and Bridging would be more feasible because highway capacity would not be reduced. But, the costs would be substantial without any real estate return. Even if developments could build on the caps, they could only pay a small fraction of the cost.



Figure 4.9: The Fifth Street Bridge, 2008

Burying or Bridging are undoubtedly the most expensive techniques. Precedents in Seattle, Milwaukee, Boston, and Cincinnati reveal that just two of the Connector's eight miles could take over 30 years and cost billions of dollars. Keep in mind that Boston's buried Central Artery is a 1.7-mile-long corridor, not including roadways under the harbors, and cost \$14.8 billion. On the other hand, Manhattan's removal of the West Side Highway and its creation of the five-mile West Street boulevard cost less than \$1 billion in under 10 years (appendix D refers to a summary chart that includes cost estimates of possible design strategies for Atlanta's Connector).

For the short run, retaining and ameliorating seem to be the best design strategy. Additionally, it can be based on several related actions, incorporating caps and bridges

where feasible. One possibility could add landscape—like an urban forestry program—to line both sides of the Connector with trees. This would require modest change eliminating some parking lots and, in the long term, relocating a small number of buildings. Other possibilities could be to install local streets on both sides, where possible, so that over time buildings could be designed or modified to front the local streets and the Connector instead of turning their backs or sides. If this were combined with new bridges and landscape elements, it could go a long way toward ameliorating the negative impacts of the Connector.



Figure 4.10: The northernmost segment of the Downtown Connector at Midtown [25]



Figure 4.11: The segment just south of Midtown at the Grady Curve [25]



Figure 4.12: The segment just south of the Grady Curve through Summerhill at Turner Field [25]

Concluding Remarks for Atlanta

Can Atlanta agree to address the Downtown Connector? At this time it is difficult to imagine. But, it was difficult for many to imagine Atlanta as the rail hub of the Southeast in 1837 when the city was founded. It was difficult for many to imagine Atlanta being the air transport hub of the Southeast, the busiest airport in the U.S, and linked to more global cities than any other airport in the U.S. when former Mayor Andrew Young declared Atlanta to be the “Next International City.” And, it was difficult for many to imagine that Atlanta would ever be the host of the 1996 Centennial Olympic Games. Imagining Atlanta without the Downtown Connector is easy. The next step is to make it happen – bury, demolish, tame, cap and bridge, ameliorate or even relocate – but the critical issue remains making traffic engineering and transportation planning subservient to urban design and the bigger dream of Atlanta as a sustainable and livable city.

CHAPTER 5

CONCLUSION

Through a rethinking of the Eisenhower National Highway System and conventional urban traffic engineering, urban designers and planners today have made rethinking downtown highways increasingly possible. Transportation needs are continually evolving. Demographics, economics, and lifestyle affect traffic demand. The highways of the mid-20th century, particularly in the United States, were designed with specific goals in mind. A key planning agenda was to connect downtowns to suburbs. Planners also sought to link industrial waterfronts to the new interstate highway system. With the current trends, those goals are often no longer necessary. Moreover, while there is always concern about urban highway congestion, sometimes traffic demand actually decreases over time, in part because drivers' behaviors cannot be predetermined. In Chattanooga, for example, Riverfront Parkway no longer served as a through-route for industrial trucking in the Tennessee River Valley as it did in the 1960s. In fact, the parkway was underused before redesigning the road as an at-grade boulevard.

Traffic demand can also be managed. The most successful highway reconfiguration projects include changes to functions with new transit infrastructure and policy. As traffic demand increases, new strategies surface, such as increased public transit user or higher fees for parking. Incentives for alternatives to transportation have been found in cities like Seoul, South Korea. The demolition of the Cheonggyecheon Expressway now includes new bus rapid transit. Seattle has plans to add new light rail when the Alaskan

Way Viaduct is replaced with a tunnel or removed all together. These improvements not only encourage shifts in modes of transportation but also set the stage for reducing carbon emissions. Awareness continues to be raised not just of the negative environmental impacts brought on by urban freeways, but also of the social repercussions cities face. Lost urban connectivity can be reversed. New connections can be made.

Design and development strategies undertaken by cities depend on geographical context, transportation needs, societal goals, and available resources, among other factors. Via massive community support, many cities have fought the political system to gain the funding needed to re-design their downtown highway corridors. Nonetheless, costs only continue to rise from hundreds of millions to billions of dollars. Cities can expect material and labor costs to inflate because the time needed to complete projects of monumental scales always takes longer than predicted, often spanning multiple years.

New York City, for example, had over one billion dollars in federal funds available to create a five-mile urban boulevard. The boulevard is abundantly landscaped and includes a bicycle greenway. In contrast, the Amsterdam suburb Zaanstadt took a more modest approach. It chose to live with an elevated highway by improving the space underneath with a grocery and recreation. Though these solutions have different scales and costs, both became equally significant public gathering spaces.

Transportation solutions should focus on urban form and quality of life. Understanding freeway impacts on the social and physical level of cities is still subjective. However, what remains certain is an urban freeway's ability to become a barrier. Barriers shape cities, such as a river or an old city wall. When they become social barriers to the citizens and the economy, a way around or through them is found.

Suburban sprawl is one reaction. Highway changes are naturally the next step to this process, followed by the freedom after removal. These decisions are conventionally measured against road capacity and travel time. However, ambitious cities like San Francisco, California and Portland, Oregon have viewed the urban freeway from a different perspective. They have set goals for waterfront access, public space, sustainability, and room for economic development in parallel with traffic planning, not separated from it.

Transportation infrastructure offers extraordinary opportunities for design, creativity, and connectivity. Highway reconfiguration provides rare opportunities for cities to strengthen separated neighborhoods or abandoned waterfronts. At the same time, some cities have learned that they need not always turn their backs to infrastructure. Its purposes are not just for transporting goods and commuters. Cities are transforming both de-commissioned and active infrastructure into new civic landmarks and unexpected spaces for urban activity. Louisville, Kentucky has built safe park space below its riverfront, elevated highway. Both Paris and New York have re-imagined elevated railroads as linear parks. The design of the High Line in New York integrates landscape with an iconic industrial-era elevated structure. The Viaducs des Arts near the Seine River changed its face to a Promenade Plantée with retail space below.

Public investment in highway reconfiguration and removal creates benefits – from development parcels to increased property values to improved quality of life. The public sector must act strategically in order to capture this value. Selling parcels of the freed real estate to the private sector for mixed-use development can spur funding for these projects. Highway removal will also enhance the value of neighboring property to

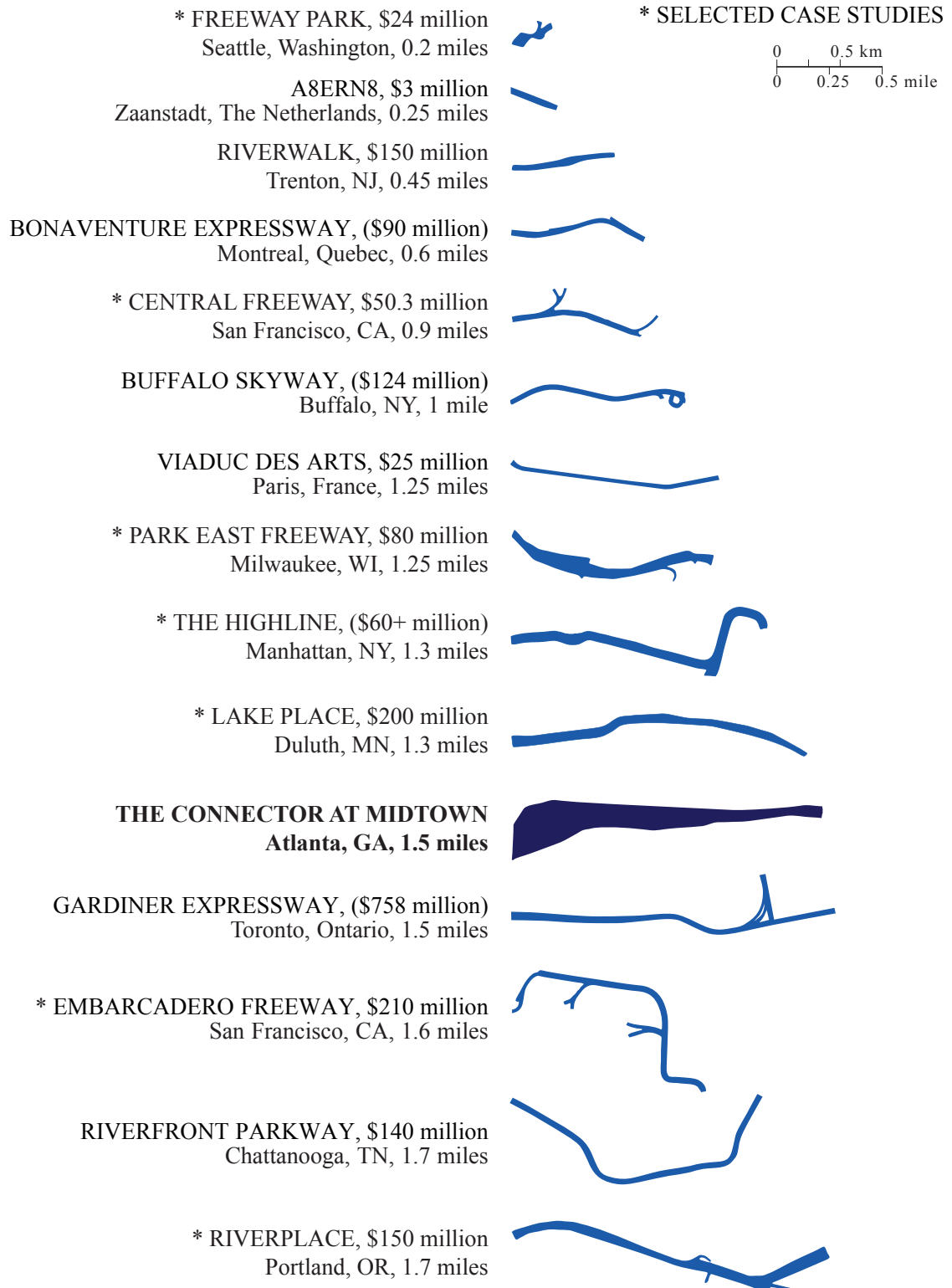
increase investment. Conversely, opportunity costs accumulate when decision-making processes drag on. Private investors battling with the public sector for land acquisition remains a problem for so many cities.

Projects of this magnitude require vision and active commitment at the highest levels of leadership from the city government to the federal decision makers. Moreover, the full range of stakeholder input, from support to opposition, must be understood and responded to at a rational and fundamental standard. Visionary leadership must include an informed and engaged public that has an active role in developing design solutions. City leaders need to support and advocate for integrated approaches to infrastructure design. Their decisions must embrace all aspects to urban design and policy—proposing the sidewalk, planning the street, encompassing the block, complementing the neighborhood, and considering the undivided city. Public space, transportation, and economic development opportunities are not separate.

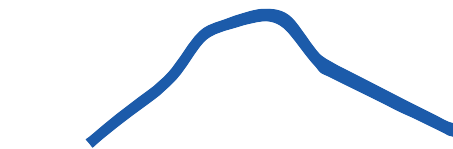
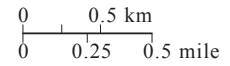
The current highway planning process is a well-intentioned effort aiming to ensure that the mistakes of the Interstate-building era will never be repeated [10]. But this is not enough. Highway planning must be considered as one part – and not the most important – of the process of building sustainable cities. No two cities are alike. Designing a uniform highway system created a “copy and paste” technique that now exists in multiple cities. Transportation systems must adapt to each city individually, better integrating land use, urban form, and its surrounding geographical framework.

APPENDIX A

SCALE COMPARISON OF PROJECT SITES



* SELECTED CASE STUDIES



* THE CENTRAL ARTERY
AND THE ROSE KENNEDY GREENWAY, \$14.8 billion
Boston, MA, 1.7+ miles



EAST RIVER ESPLANADE, (\$150+ million)
Manhattan, NY, 2 miles



ALASKAN WAY VIADUCT, (\$4+ billion)
Seattle, WA, 2 miles



* CHEONGGYECHEON RIVER DAYLIGHTING, \$900 million
Seoul, South Korea, 3.75 miles



* WEST STREET AND THE HUDSON RIVER PARK, \$811+ million
Manhattan, NY, 5 miles

APPENDIX B

ADDITIONAL PROJECT IMAGES AND PLANS



Figure B.1: The Federal Highway Administration breaks ground [12]

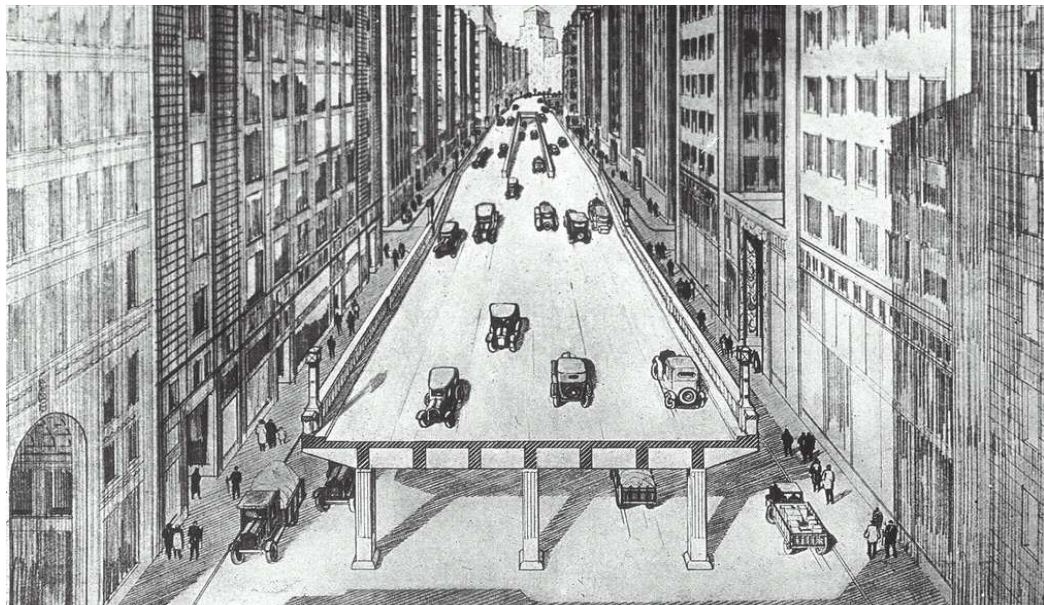


Figure B.2: Proposed design of Boston's Central Artery, 1925 [15]



Figure B.3: Boston's Central Artery near the central business district, 1989 [20]



Figure B.4: Nighttime view of Boston's New Greenway, the Central Artery buried underneath, 2008 [22]

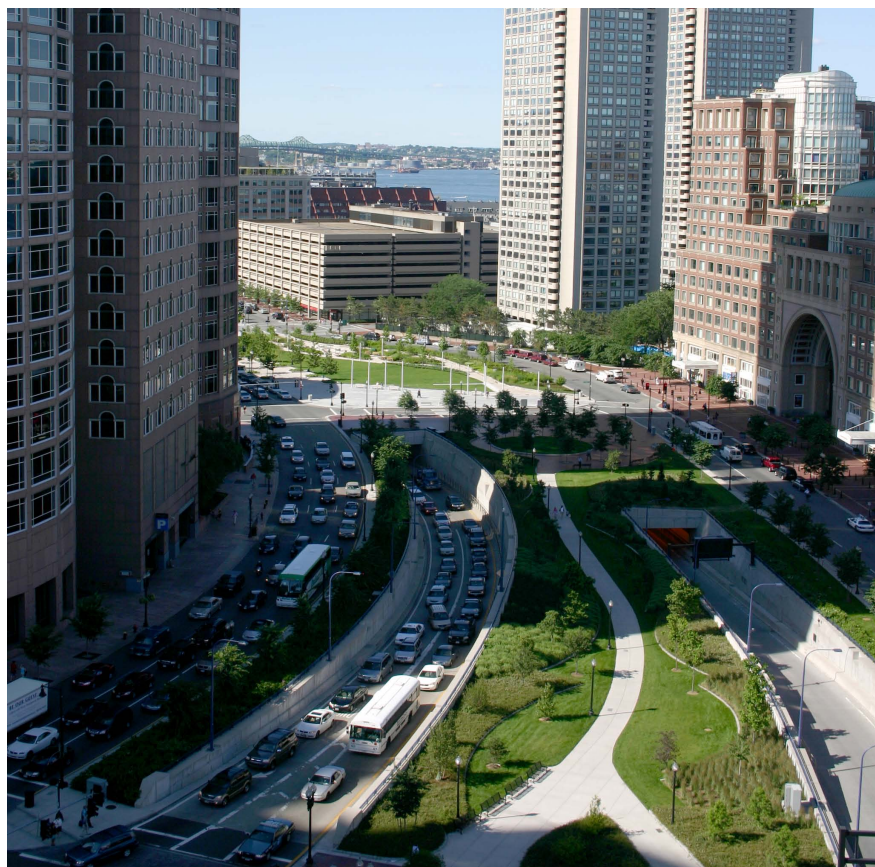


Figure B.5 and B.6: Boston's The Central Artery, 1989 [20]
and a post-burial view of downtown, 2008 [22]



Figure B.7: North Boston, 1981 [16]



Figure B.8: Now the Zakim Bridge, 2010 [19]



Figure B.9: A Partial Collapse of New York's West Side Highway, 1974 [24]



Figure B.10: Aesthetics of the West Side Highway, 1974 [24]



Figure B.11: A View Towards the Hudson River, 1974 [24]



Figure B.12: View towards the connection at 57th Street with existing Route 9A, 2009



Figure B.13: Embarcadero Freeway Map, 1972 [27]

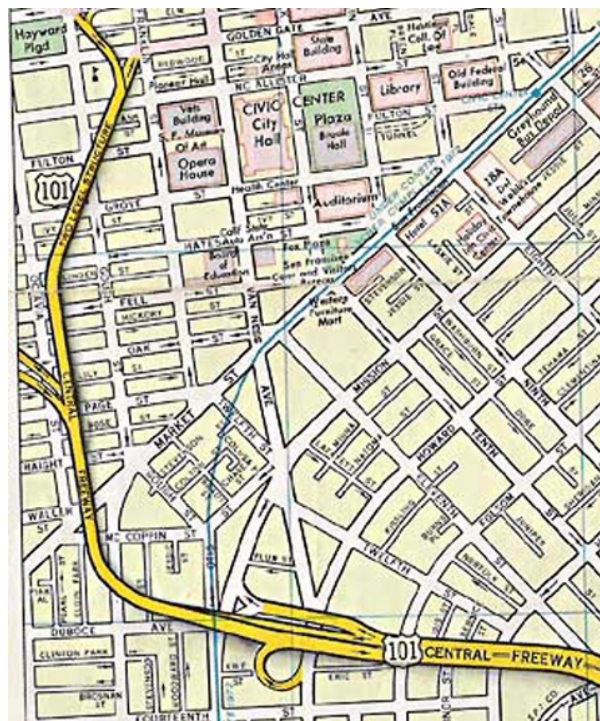


Figure B.14: Central Freeway Map, 1972 [27]



Figure B.15: The collapse of the Embarcadero Freeway due to the earthquake, 1989 [29]

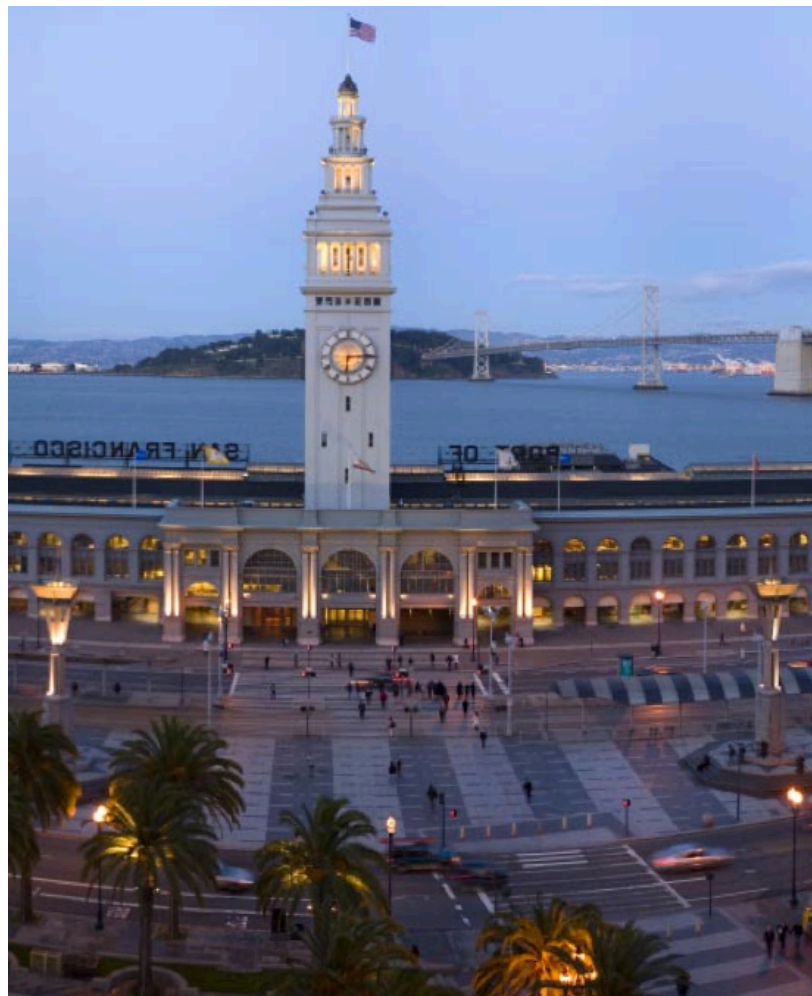


Figure B.16: The Embarcadero today [28]



Figure B.17 Central Freeway, 1987 [19]



Figure B.18 Northeast ramp demolished, 1993 [19]



Figure B.19: End ramp's exit is fixed, 2001 [19]

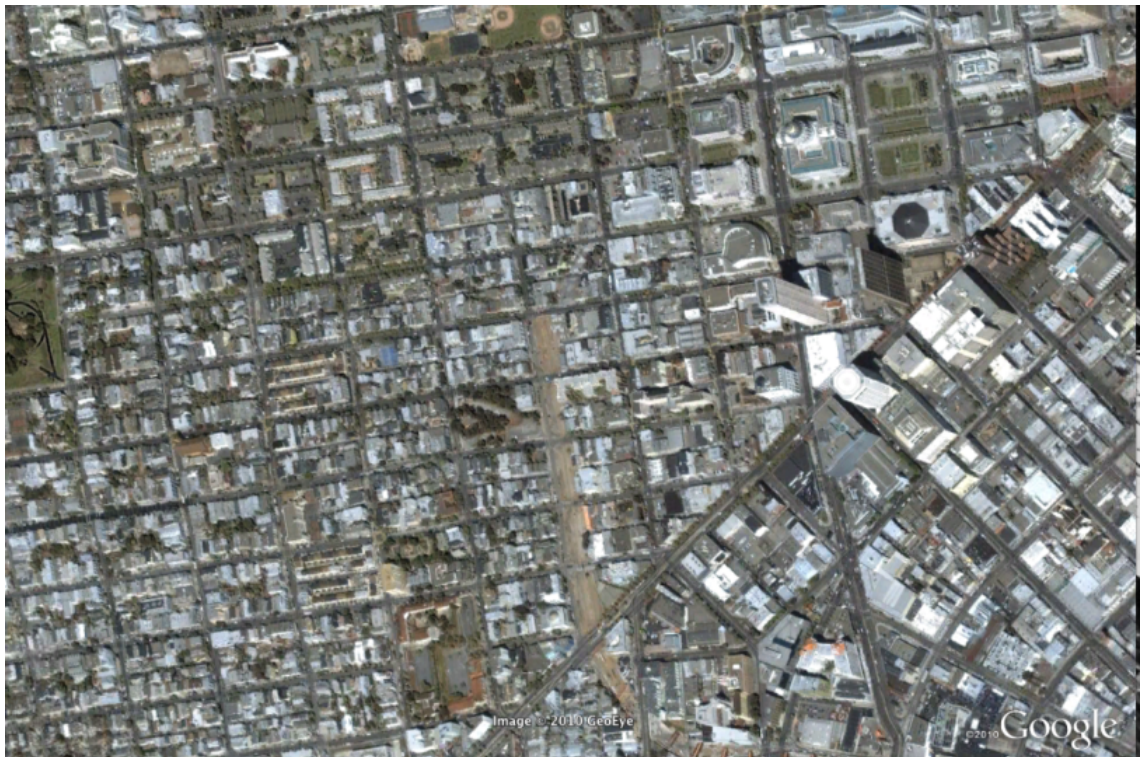


Figure B.20: Total removal, 2003 [19]



Figure B.21: Octavia Boulevard, 2004 [19]

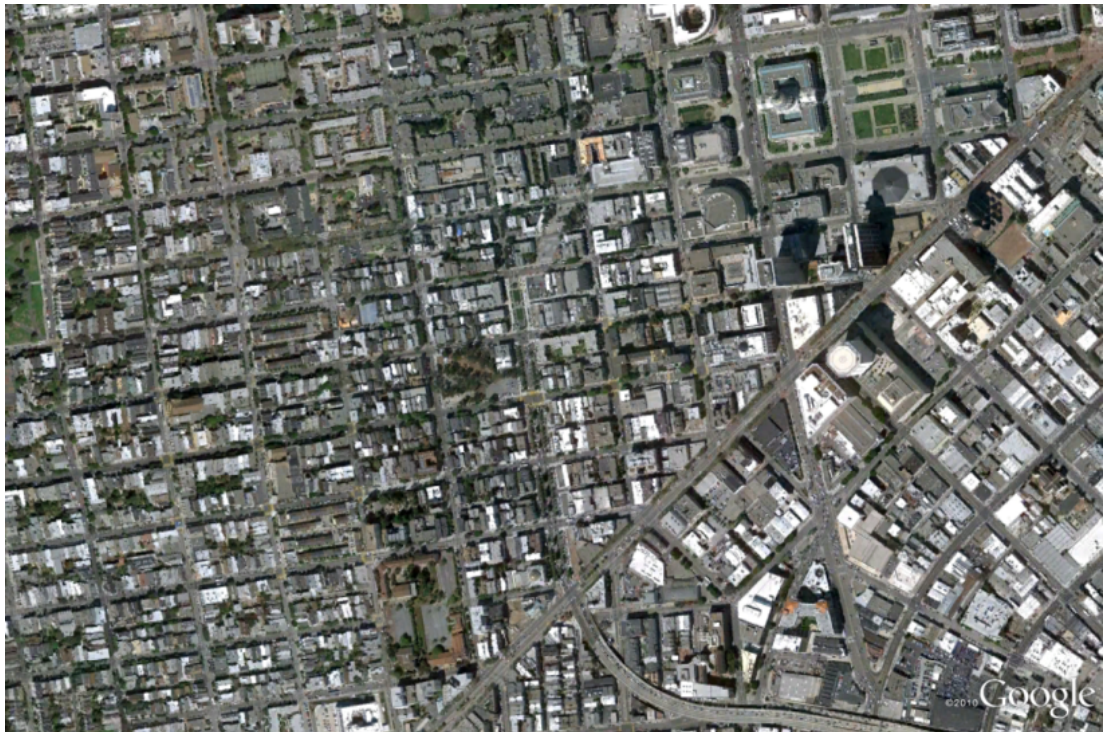


Figure B.22: Boulevard today with mature vegetation, 2010 [19]



Figure B.23: Imagery of the Embarcadero Freeway, 1987 [19]



Figure B.24: An entrance to the highway tunnel underneath Seattle's Freeway Park [30]

APPENDIX C

ADDITIONAL PHOTOS OF HISTORIC ATLANTA



Figure C.1: Forsyth Street in Atlanta, 1926 [32]



Figure C.2: Five Points in Atlanta, 1940 [32]



Figure C.3: Building a segment of the downtown highways, 1958 [32]



Figure C.4: Aerial of the Downtown Connector, 1963 [32]



Figure C.5: Satellite Imagery of Atlanta, 1958 [32]



Figure C.6: Skyline, 1956 [32]



Figure C.7: Skyline, 1961 [32]



Figure C.8: Skyline, 1965 [32]



Figure C.9: Aerial View of the Downtown Connector, 1967 [32]



Figure C.10: The Downtown Connector, 1967 [32]

APPENDIX D

DESIGN ANALYSES OF THE DOWNTOWN CONNECTOR

D.1 Context

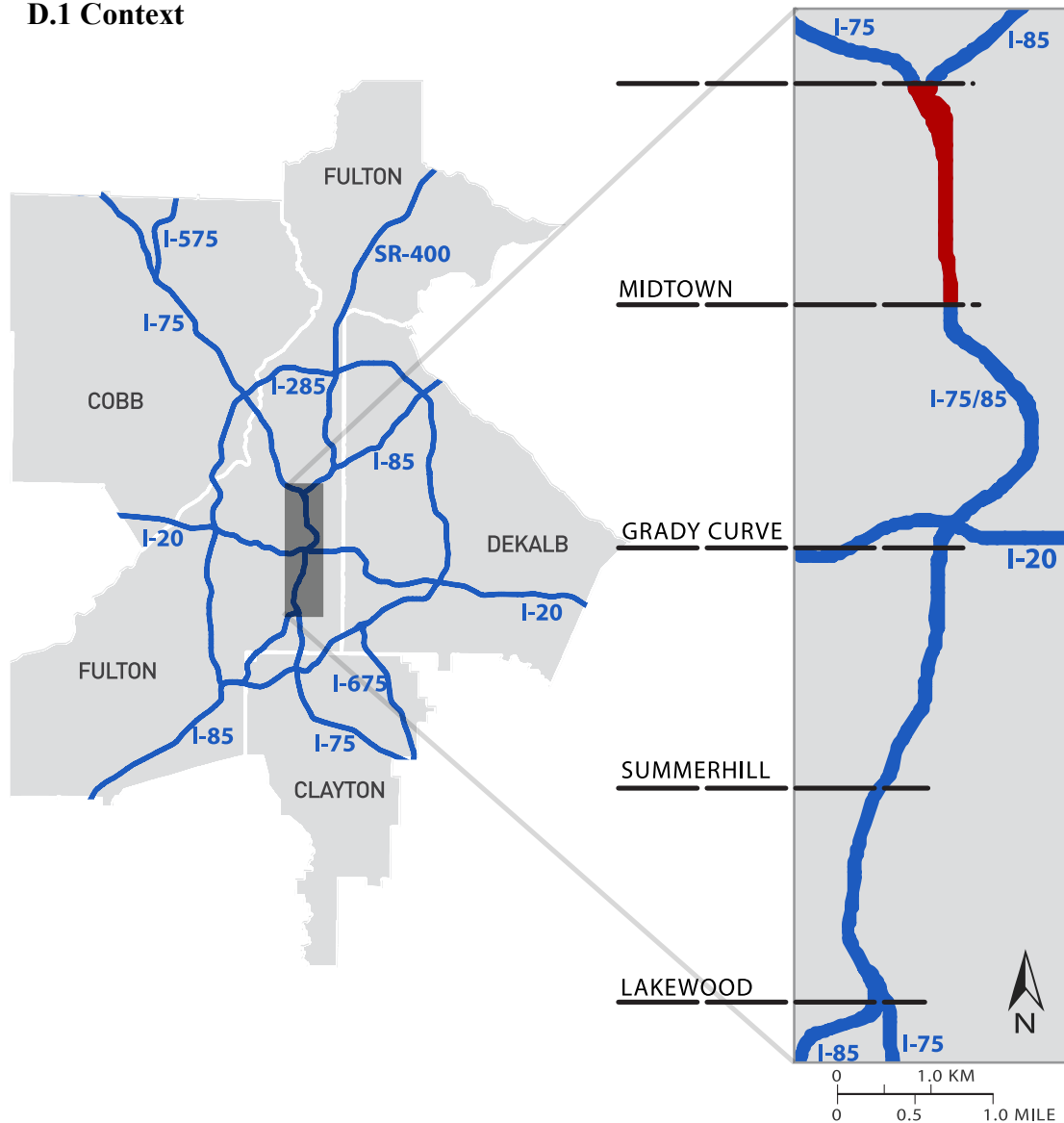


Figure D.1: Base map of Atlanta's highways, highlighting the Downtown Connector

The zoomed area includes the entire stretch of the Downtown Connector I-75/85. For feasibility of any strategy to change the face of this highway, the 7.5-mile length is divided in four segments from north to south: Brookwood interchange joining I-75 and I-85 at the north of the Midtown section, Grady Curve through Downtown, Summerhill cutting across Atlanta's oldest neighborhoods and passing Turner Field, and Lakewood stretching toward the Langford Parkway Interchange and the split of I-75 and I-85.

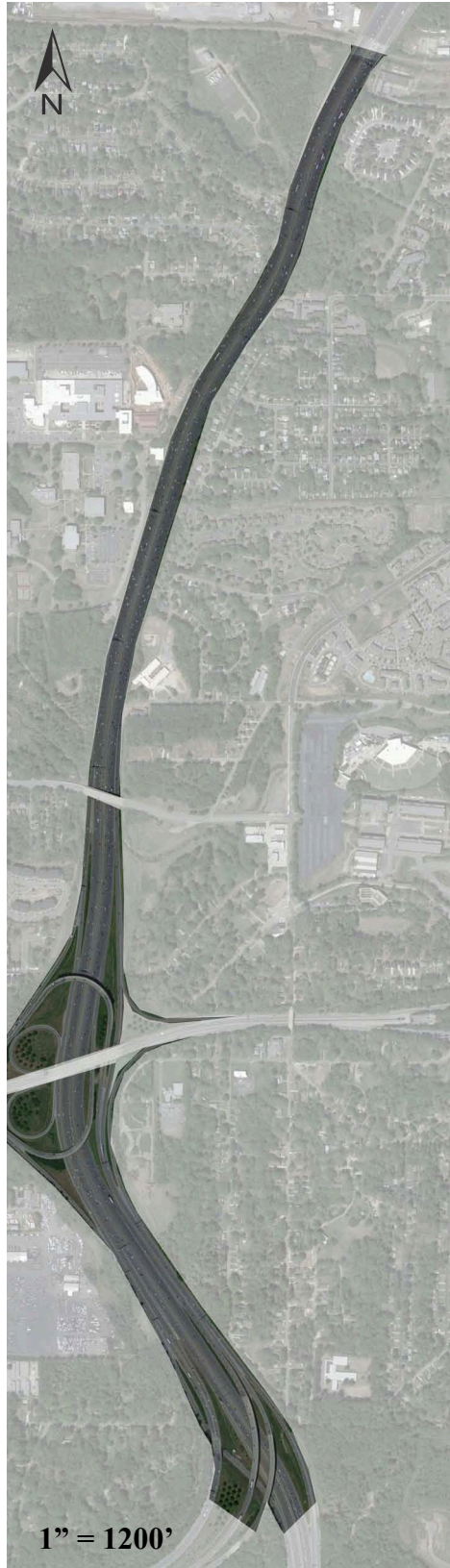


Figure D.1.1: Satellite imagery of the Downtown Connector, Lakewood segment [19]

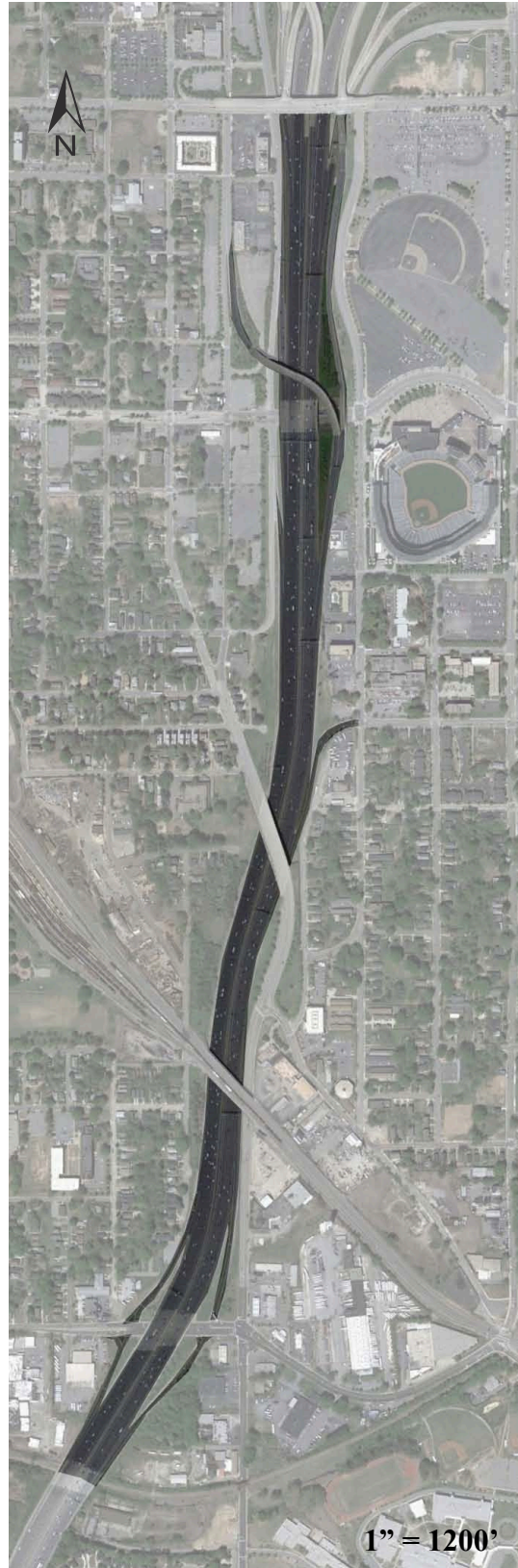


Figure D.1.2: Satellite imagery of the Downtown Connector, Summerhill segment [19]



Figure D.1.3: Satellite imagery of the Downtown Connector, Grady Curve segment [19]



Figure D.1.4: Satellite imagery of the Downtown Connector, Midtown segment [19]

D.2 Existing Conditions



Figure D.2.1: Existing Plan of the Midtown Segment



Figure D.2.2: Area at the Brookwood Split [19]

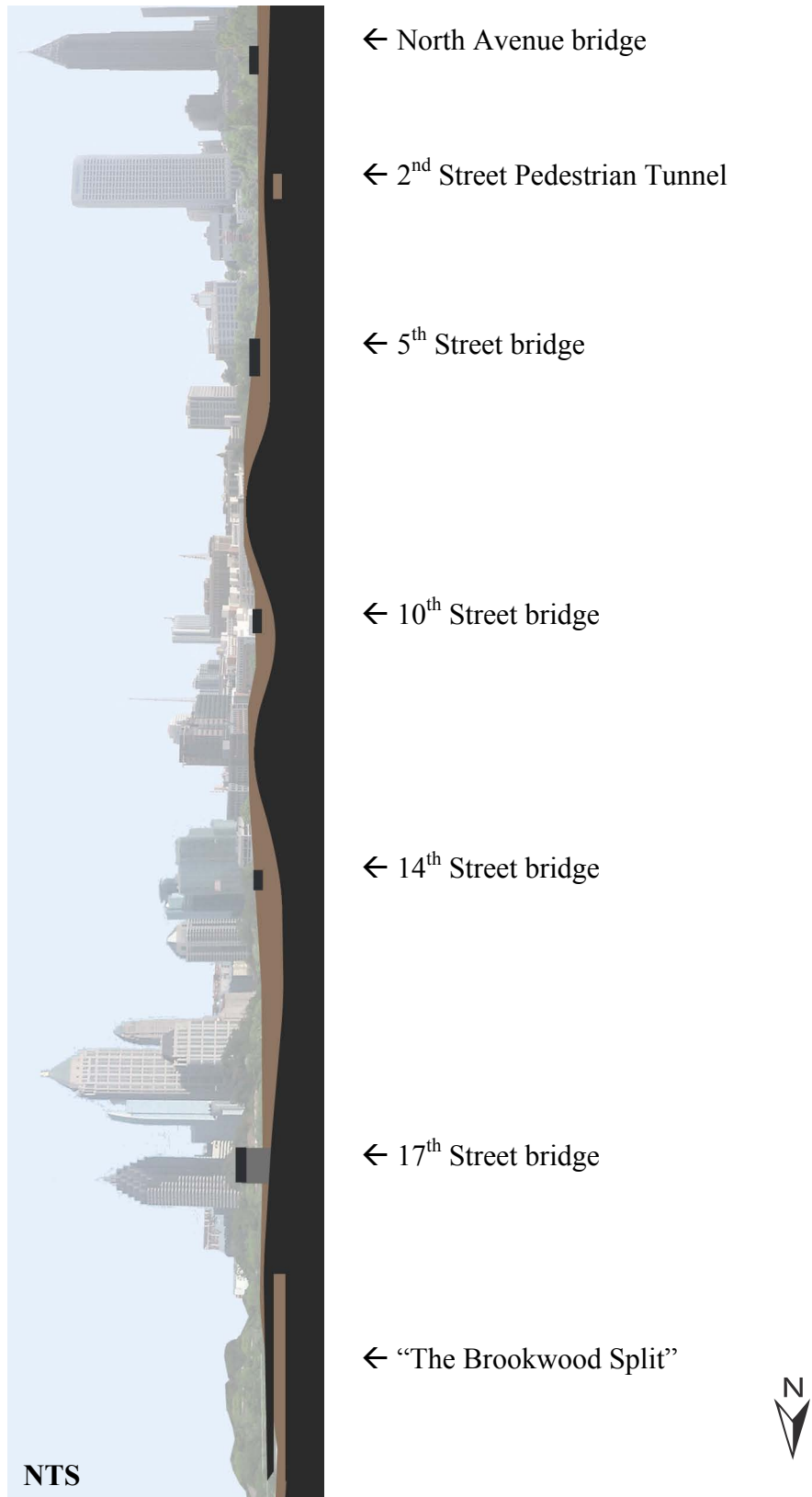


Figure D.2.3: Existing Section of the Midtown Segment



Figure D.2.4: Existing Section at 17th Street

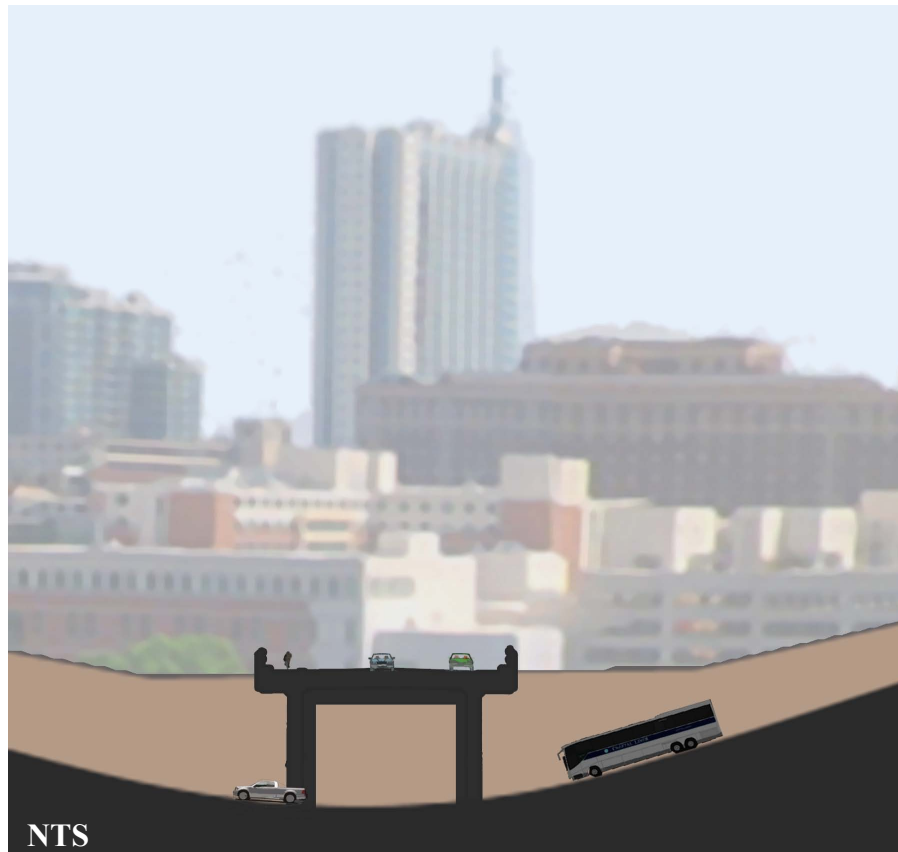


Figure D.2.5: Existing Section at 10th Street

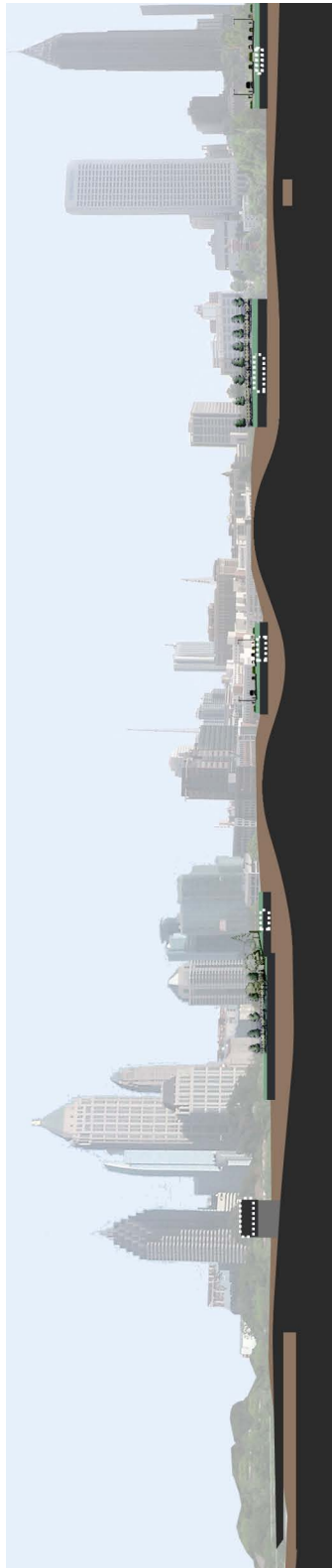
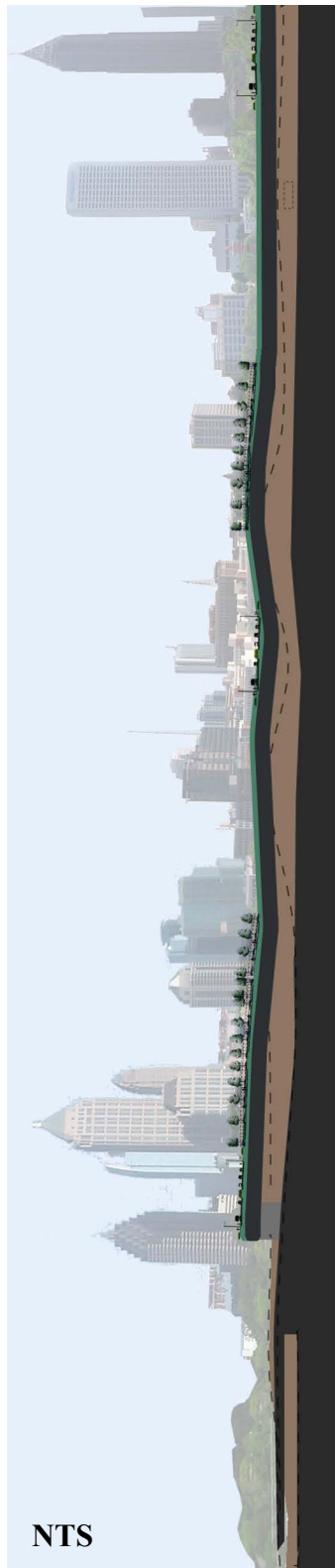


Figure D.2.6: Existing Section at 7th Street



Figure D.2.7: Existing Section at North Avenue

D.3 Design Strategies



To bury the Midtown Segment of the Connector, the change in existing grade will require smoothing. Essentially a vast, single cap will be placed along the segment. Covered starting at 17th Street, the Connector cannot travel below existing grade until 14th Street because of the elevation of the Brookwood Split. Burying this interchange is not shown.

The plan for bridging will not change the grade of the highway. Existing bridges at 14th, 10th, 5th, and North Avenue are at the same elevation as the environs neighboring. These four caps can be widened but not connect with each other because of undulations in the highway.

For burying or bridging, the road capacity is untouched, except during times of construction, which may prove to be too severe. Refer to the chart and the end of this appendix for estimated costs of each strategy.

Figure D.3.1 and D.3.2: Sections of the Burying strategy and the Bridging Strategy

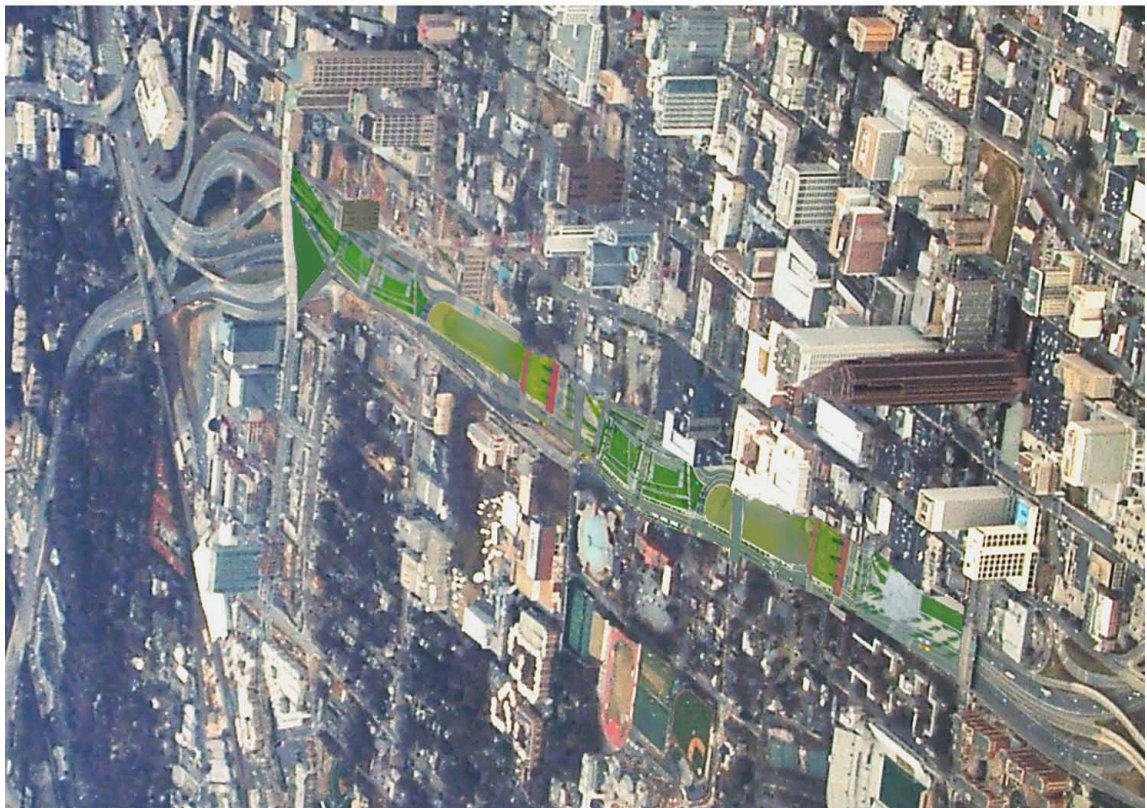
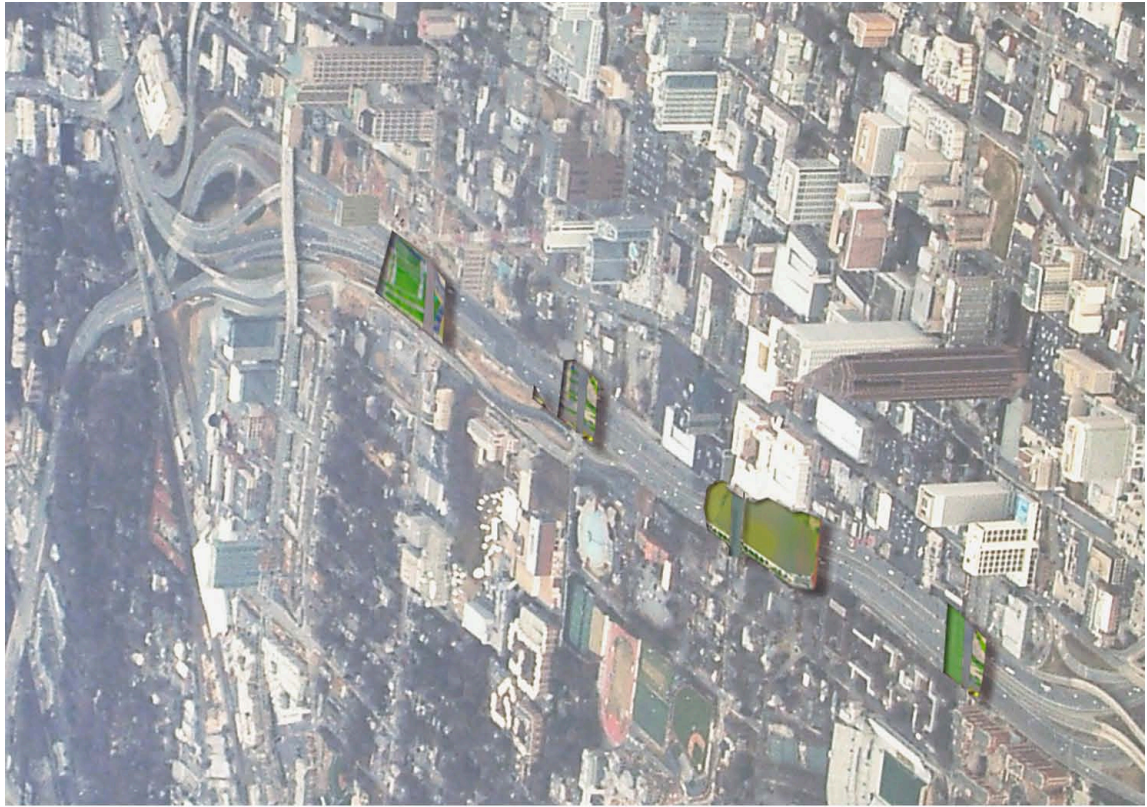
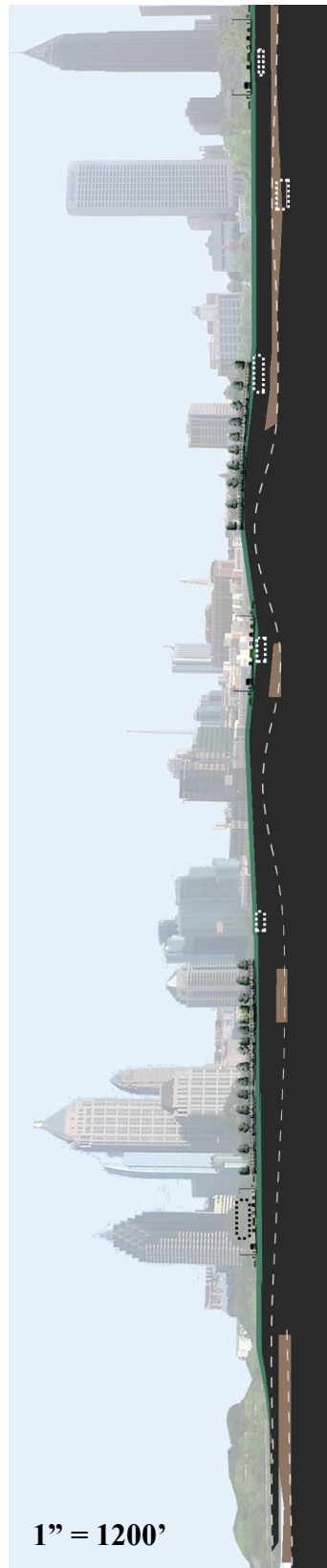


Figure D.3.3 and D.3.4: Renderings of the Burying strategy and the Bridging strategy



This strategy can succeed only if the design incorporates all parts that make up the urban environment. In other words, the private vehicle is not the first priority. The taming design reduces road capacity by removing the 14-lane highway and replacing it with a 6-lane boulevard. For excess width, transit, parking, wide sidewalks, and green space can easily add span to the corridor.

The Brookwood interchange requires a transition of roadway traversing between the existing two highways to the north toward their join to become a boulevard. The existing design can be modified rather than completely resurfacing the intersection. Additionally, accessible park space can be added to ameliorate the interchange.

The boulevard is bounded by the intersection with the new 17th Street because its bridge must be removed as it is above grade. All other existing bridges in this segment are at grade and can remain. Areas of the highway below grade can be filled in to meet with the neighboring parts of the city. While filling in, space can be left for any future underground transit.

The possibilities are endless with the freeing of the Connector's corridor. Old and new connections in Atlanta's urban form can be created. Blighted areas can be accessible for new development. There would be ample space for transit, bike paths, and nature.

Figure D.3.5: Section of the Taming strategy

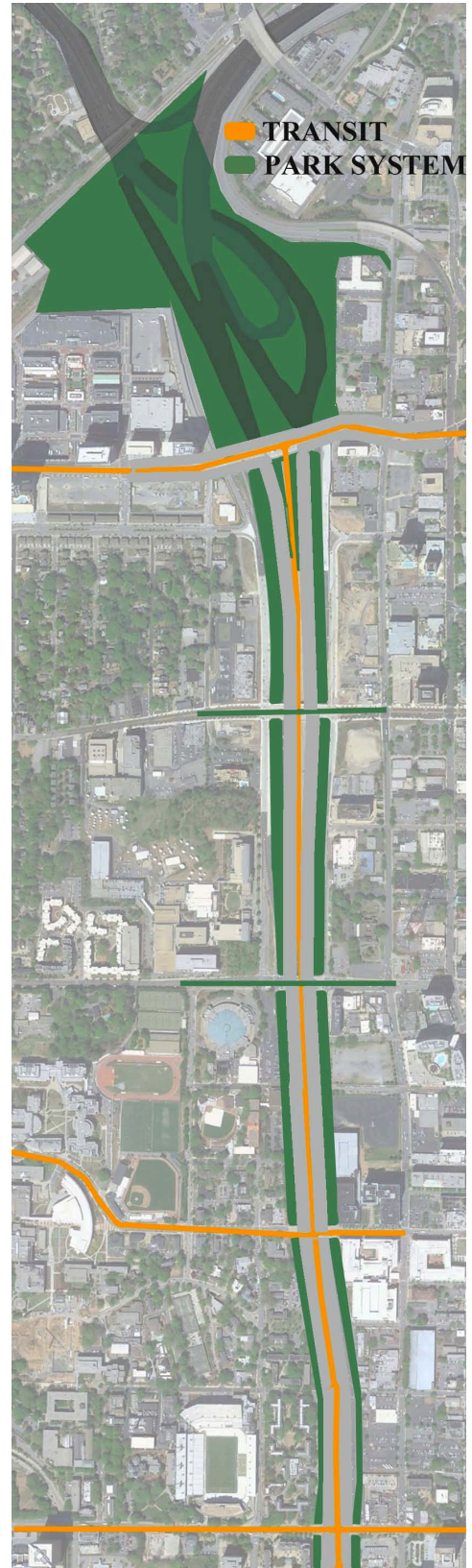
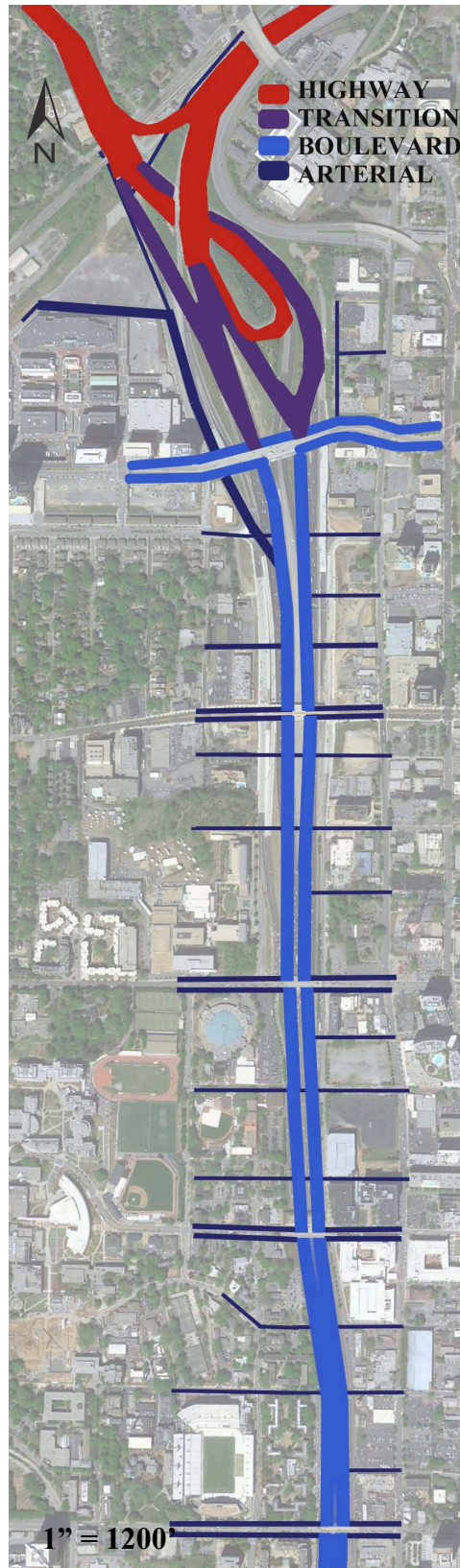
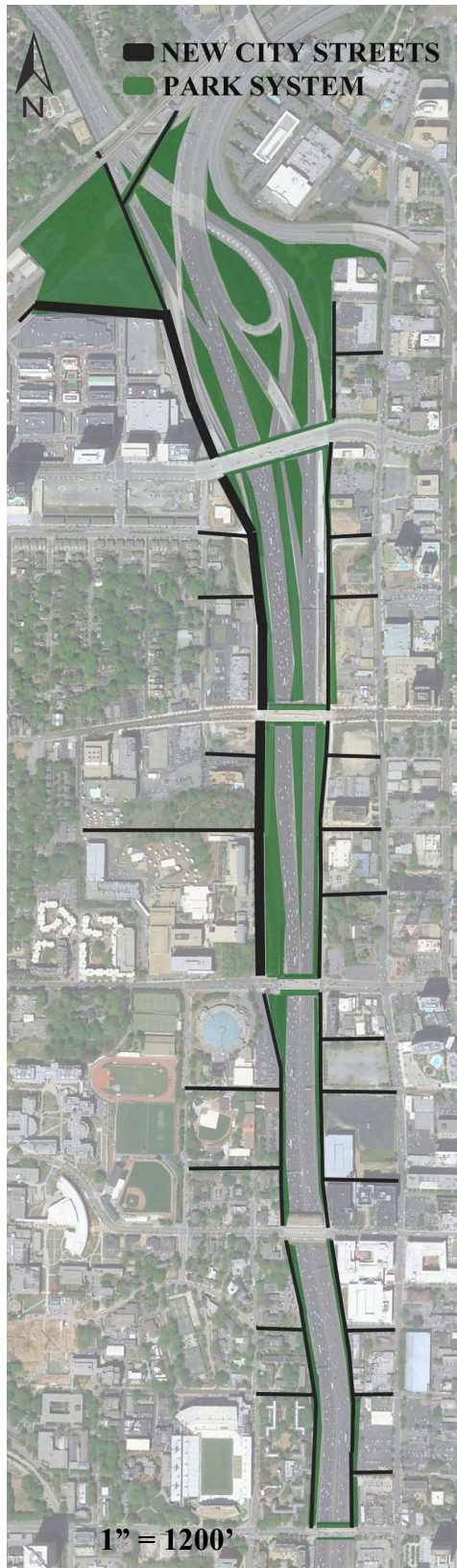


Figure D.3.6 and D.3.7: Diagrams of the Taming strategy, increasing connectivity



Retaining and ameliorating Midtown's highway segment can include a number of design proposals. It may take strategies from any typology to change the face of the highway with the exception of reducing road capacity by more than 25% percent. Options considered in this diagram focus on minimizing cost and do not show any additional caps over the highway. Notwithstanding, limiting view of the eyesore requires massive greening methods. An urban forest and park can inhabit the land surrounding the Brookwood interchange. The example set by the 5th Street bridge to add greenspace and sculpt a unique wall design can be mimicked by the other four existing bridges.

Spaces along the edges of the highway and the medians themselves would become a greenway of trees and trails. These edges could be much wider than the existing, seeing as at least half of the highway access roads and ramps would be repurposed, limiting entry to the Connector. These parallel corridors may be part of the new park system. They might also become a part of the network of city streets. Specifically, the southbound, one-way off ramp along the western edge could easily be less expansive in width and length. With the highway-access roads being blocks shorter, a two-way street can replace some sections and can add entry to existing collector streets that currently end once they reach the edge of the ramps or freeway walls.

Figure D.3.8: Diagram of the Ameliorating strategy

Cost Estimates for the Midtown Segment [34]

Miles = 1.5

Lanes = 14

STRATEGY	INITIAL COST	ANNUAL COST
RETAIN	0	\$7 million
BRIDGE	\$600 - \$900 million	\$20 - \$25 million
TAME (6-lane)	\$100 - \$200 million	\$5- \$10 million
AMELIORATE	\$10 - \$150 million	\$10 - \$20 million
DEMOLISH	\$10 - \$20 million	0
BURY & CAP	\$2.2 - \$3 billion	\$25 - \$30 million

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